

One Hundred and Fifty Years of Botany at the California Academy of Sciences (1853–2003)

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FOREWORD

History does not write itself, which is why my name appears on this publication. Although assembling it has taken me from my studies of Acanthaceae and work on a nearly completed account of the flora of San Francisco County, my work on this project has truly been a labor of love. Who would not enjoy writing about such fascinating characters, their tragedies and triumphs, and the influence they had on their department, institution, and discipline?

This account is “a” history of botany at the California Academy of Sciences rather than “the” history of botany there. It focuses on the most famous curators in the Department of Botany: Kellogg, Curran/Brandege, Eastwood, and Howell. I harbor enormous respect for each of them and what they accomplished under circumstances far less ideal than those enjoyed by curators at the Academy today. Their achievements resulted primarily from who they were as individuals rather than from support afforded by their employer. In time, Breedlove’s name may join them based largely on his important collections from Chiapas, his collaborative ethnobotanical studies, and his influence on the evolution of the Academy’s Department of Botany into a major center for tropical systematics. The current curators owe an enormous debt to our predecessors who established botanical science at the Academy and built a solid foundation for its future.

Much of this account grew out of my presidential address to the American Society of Plant Taxonomists in 2001. Many members of that audience indicated that the stories involving Kellogg, Curran/Brandege, Eastwood, and Howell should be published to inspire future generations of plant systematists. While only a few of “the tales” from that talk are related in this account, all of them can be found among the literature cited herein.

At the Academy, I have benefited from the invitation of Alan Leviton, Editor of Scientific Publications, to write an account of the Department of Botany; archivists and librarians Michelle Wellck, Karen Elsbernd, Larry Currie, and Anne Malley of the Academy’s Library and Special Collections who provided access to materials in their care and helped me locate other references; Department of Botany associate Catherine Best who wrote up an account of the recent history of the California Botanical Club for my use; and the staff of the Department of Botany (especially collections manager Bruce Bartholomew, secretary Janet Jones, and senior curator Frank Almeda) who provided materials or insights that improved the text. The following individuals and organizations provided assistance for which I am most grateful: Bancroft Library of the University of California, Richard Beidleman, Meredith Blackwell, California Historical Society, Dennis Desjardin, Barbara Erter, Wilma Follett, Deborah Lewis, DeAda Mally, LuEsther T. Mertz Library of the New York Botanical Garden, Ron Petersen, Donald H. Pfister, Thomas Ranker, Peter Raven, Paul Silva, Stephen Sinon, Kim Steiner, Barbara Thiers, Susan Thomas, Sutro Library, University and Jepson

herbaria of the University of California at Berkeley, and Rebecca Wenk. I am especially grateful to Richard Beidleman, Rogers McVaugh, Peter Raven, and Alan Whittemore for reading early drafts of the manuscript and making numerous helpful comments, as well as Hallie Brignall who read intermediate versions; and to Andrew Doran for locating, scanning, and granting permission to reproduce several items from the archives of the University and Jepson herbaria, University of California, Berkeley. I made considerable use of the Department of Botany’s “biography files,” an informal archival resource housed in the Department that contains about 10 linear feet of archival boxes with newspaper clippings, obituaries, letters, photos, announcements, newsletter articles, etc. pertaining to botanists and others, most of whom have or had an affiliation with the Academy or other institutions/organizations in California. These files were begun either by Eastwood or Howell, and were meticulously augmented by Howell during his employment and retirement. Finally, I wish to thank the California Academy of Sciences for making possible the remarkable story of botany at the institution and for supporting my efforts to bring “a” version of that story into print.

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INTRODUCTION

The discovery of gold in the foothills of California’s Sierra Nevada in 1848 was to have a major impact on the discipline of systematic botany. Before the Gold Rush of 1849, Yerba Buena had been a sleepy and isolated port village of some 459 inhabitants. With the influx of miners and those feeding and clothing them, and with California’s admission to the Union in 1850, the population of the town, which had been renamed San Francisco in 1847, grew enormously. By 1853 the wildest days of the Gold Rush had past, and the growing town was attaining many of the trappings associated with contemporary cities—such as the formation of an organization devoted to the study

of natural history. On 4 April 1853, just five years after gold had been discovered at Sutter's Mill, seven men met in San Francisco to form the California Academy of Natural Sciences.

Tantalizing fragments of California's botanical bounty had been gleaned from various regions along its Pacific coast by early explorers and expeditions such as those of La Pérouse in 1786, Malaspina in 1791, von Krusenstern in 1806, and Kotzebue in 1816 (see Alden and Ifft [1943], Ewan [1955], and Thomas [1969] for details of these and other early expeditions to California). Yet, by the middle of the nineteenth century, most of the state remained *terra incognita* to the scientific community and the richness of its biological diversity was only suspected. Indeed, travel to California was primarily by ship (either around Cape Horn or to Panama, overland across the isthmus, and thence by another ship to the west coast of North America) and was both time-consuming and dangerous. Its cities were isolated from the scientific centers of Europe and the eastern United States.¹ Many of its inland mountains and valleys were part of the American frontier and those seeking to inhabit its lands tended to be hardy, self-reliant, and naturally courageous individuals. Institution-based science conducted by resident scientists was desperately needed in such a large and biologically rich area, but the obstacles to its early establishment and success would prove to be nearly insurmountable. With a good deal of luck and even more dedication and hard work from its early members, the California Academy of Sciences was able to meet its challenges, persevere through some desperate times, and remain a center for scientific activities on the Pacific Coast of North America for 150 years. The study of plants at the Academy played a major role in the institution's colorful history and scientific accomplishments.

Because there is already a considerable body of literature on the history of botany and botanists at the California Academy of Sciences, this account does not attempt to repeat all that has been published previously. Rather, it focuses on some of the departmental highlights and prominent personnel, provides access to much of the extant literature relating to botany at the Academy, and offers some information not readily available from other sources. Although this history of botany at the Academy concentrates on the Department of Botany and its curators, it also includes information about those involved in botanical activities at the institution, whether or not they were on the Department's staff. Our knowledge of botanical activities at the Academy during its first fifty years has been greatly enhanced with the publication by Leviton and Aldrich (1997) of Theodore H. Hittell's historical sketch of the institution from 1853 until 1906, to which they made substantive additions.²

The historical account below is divided into five chapters, each representing a distinctive period of time for botany at the Academy, and most focusing on a single prominent curator. A sixth chapter provides some insights and perspectives on botanical science and its practitioners at the Academy during the past 150 years. Endnotes and appendices offer additional relevant information and place some of the events, activities, and people into a broader context.

I. BEGINNINGS AND EARLY HISTORY (1853–1883)

The study of plants and maintenance of an herbarium date from the earliest days of the California Academy of Sciences.³ The promotion of natural science in the new state of California⁴ was the stated goal of the Academy's founders from their first meeting in 1853. As central to its mission, the Academy sought to survey the natural resources of California and to make a "collection of a cabinet of her rare and rich productions" (Hittell 1997:13). Thus, the scientific study of plants in San Francisco was inevitable. Furthermore, three of the seven founders of the Academy were doctors of medicine, and, at that time, botany was an essential component of medical science and education. At the meeting of 18 July 1853, Academy president Andrew Randall (Fig. 1A) offered

"a reward for certain essays on trees" (Miller 1942). An essay contest was held and at the meeting of 2 January 1854, a prize of \$50 was awarded for "the most complete and practical essay on Californian and exotic trees, shrubs, grasses, and plants; their adaptation to the sands and soils of the sea-coast and the shores of our bays and rivers—for breaking the violence of the coast winds, arresting and preventing sand drifts, and guarding against encroachment and damage by waves and floods; with instructions" (Miller 1942). On 24 July 1856, former president Randall was shot dead by a gambler named Joseph Hetherington. Five days later, Hetherington was lynched by the city's Committee of Vigilance.⁵ On the day following Randall's funeral and the day before his murderer was hanged, the Academy held its regular weekly meeting⁶ at which "Mr. A.F. Beardslee deposited for the Library, Michaux and Nuttall's *North American Sylva*; also a pamphlet containing descriptions of new coniferous trees of California" (Miller 1942). The calm pursuit of botanical activities at the young Academy in this "wild west" atmosphere would foreshadow the perseverance of botanical science at the institution under even graver circumstances to come.

Albert Kellogg (1813–1887; Fig. 2), a physician and pharmacist with a keen interest in botany, was one of the seven founders of the Academy who attended its organizational meeting in 1853. Kellogg was born in New Hartford, Connecticut and trained in medicine at Charleston, South Carolina and at Transylvania College in Kentucky (Ewan 1953). It was during his travels in the southern and western United States for the benefit of his health that he became interested in botany (Hittell 1997).⁷ Kellogg arrived in California in 1849 and eventually settled in San Francisco where he established a pharmaceutical business and practiced some medicine (Ewan 1953). Apparently, he was not very successful at either venture; Hittell (1997:35) noted that, "Dr. Kellogg, who kept a drug-store, was almost too much engrossed with hunting and working over new plants to patiently wait upon customers," while Greene (1887) indicated that he was never known to request payment for his services.

Neglect for his profession was balanced by enthusiasm for plants and the new Academy of amateur scholars. In fact, Kellogg was devoted to the organization from its inception. He served it in various administrative roles (e.g., vice-president, librarian, curator, and director of the museum),⁸ was appointed to numerous committees, and was a frequent and vocal participant at the meetings (Hittell 1997). As the Academy's first curator of botany, he earnestly and optimistically believed in the success and importance of the institution and he stimulated members and visitors to communicate specimens to it for identification and study (Ewan 1953). Although he had collected plants along the west coast of South America during his voyage to San Francisco,⁹ one of his first major collecting expeditions came in 1867 when he accompanied George Davidson of the United States Coast Survey and W.G.W. Harford to Alaska (Ewan 1953). There he collected "nearly five hundred species of plants" in triplicate (Davidson 1889:v). Sets of those collections went to the Smithsonian Institution (US), the Academy of Natural Sciences (PH), and the California Academy of Sciences (CAS). His subsequent collections from various parts of the Pacific Coast of North America (primarily California; Fig. 3A–B) were often numbered, but a new number series was apparently initiated each year (Ewan 1953).

Kellogg's innumerable papers on "Western" (primarily Californian) plant life were read before the members of the Academy and were usually accompanied by specimens and/or his drawings of the plants in question (Hittell 1997). Kellogg published his botanical discoveries in local newspapers and magazines (e.g., *The California Horticulturist and Floral Magazine*, *The Hesperian*, *Pacific Rural Press*, and *The Pacific*),¹⁰ as well as in Academy publications (e.g., *Proceedings of the California Academy of Sciences*, *Bulletin of the California Academy of Sciences*). When publication of the Academy's *Proceedings* was suspended in 1877¹¹ Kellogg sometimes described "new" species in manuscripts that remained in the herbarium; some of these were subsequently

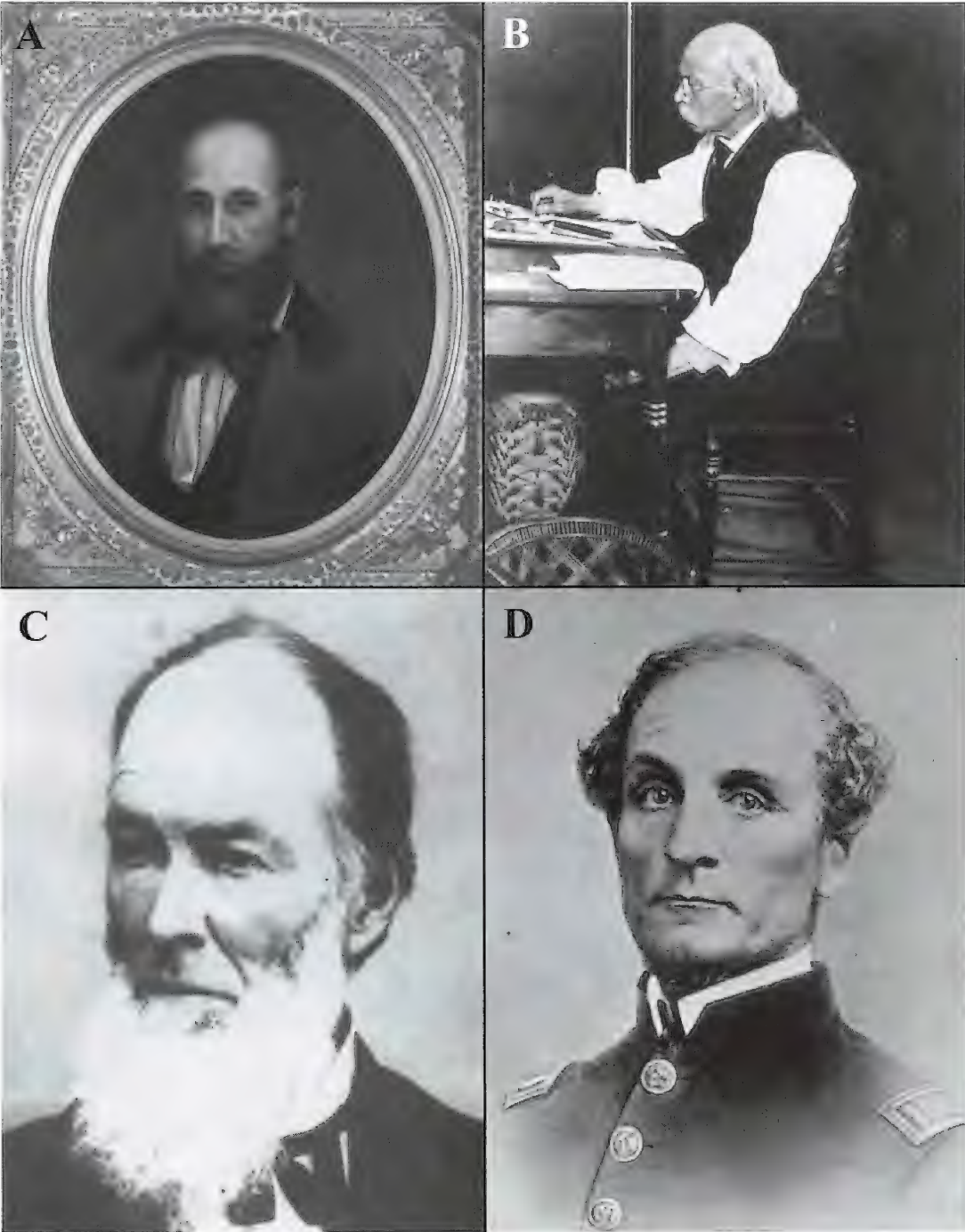


FIGURE 1. Early Academy members with botanical interests. A. Andrew Randall (from undated portrait, CAS Special Collections). B. Hans H. Behr (from Academy News Letter 37, 1943, Dept. Botany "biography files"). C. William P. Gibbons (undated photo, CAS Special Collections). D. John B. Trask (undated photo, CAS Special Collections).



FIGURE 2. Albert Kellogg at 72 years of age, Academy co-founder and first curator of botany (undated photo, UC Herbarium Archives).

described by others based on Kellogg's materials (Brandege 1893a). Kellogg's publications resulted in the initial descriptions of several well-known genera (e.g., *Marah*, *Idria*, *Bloomeria*) and 215 species (Anonymous 1943).¹²

The "Eastern" botanical establishment was not always appreciative of the attempts by the "amateurs and upstarts" (Leviton and Aldrich 1997:35) in the West (who lacked adequate library and herbarium collections) to publish their new discoveries (see Crosswhite and Crosswhite 1985). In fact, the prominent Harvard University botanist Asa Gray described Kellogg as a "good meaning soul" but "a nuisance in the science" (Dupree 1959:398).¹³ However, another prominent "Eastern" botanist, John Torrey, honored him by proposing *Kelloggia*, a genus of Rubiaceae from the



FIGURE 3. Early Academy plant collections I. A–B. Kellogg’s holotype collection of *Penstemon kingii* S Wats. var. *glaucus* Kellogg (= *P. speciosus* Dougl. ex Lindl. fide annotations by D. Keck in 1941 and J.T. Howell in 1980). C–D. Brewer’s isotype collection of *Astragalus curtipes* A. Gray, one of several putative “original” collections from the California State Geological Survey.

Sierra Nevada.

Irrespective of any faults as a botanist, Kellogg’s abilities and productivity as a botanical illustrator were considerable (Fig. 4, 5A). In 1885, curator of botany Curran indicated that Kellogg’s drawings had “only recently become accessible” to her. She published colored renditions of seven of his plates and noted that these had been “prepared for the Hesperian, and after it ceased publication, those unused were returned to him and presented to the Society [Academy] to be used in this manner” (Curran 1885:129).

Kellogg was reputed to have had a great love for all forms of plant life, but he was especially

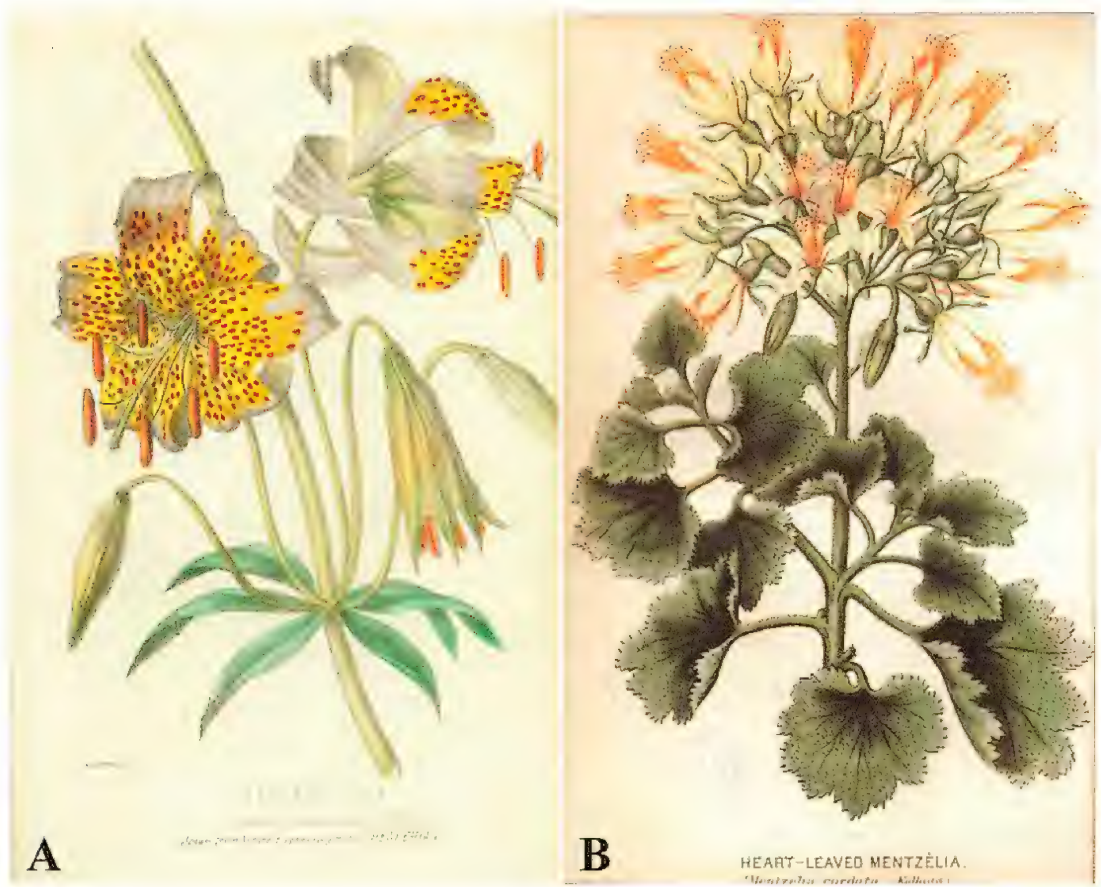


FIGURE 4. Two of Kellogg's botanical illustrations. A. *Lilium pardalinum* Kellogg (from Proc. Calif. Acad. Nat. Sci. 2:opposite page 12. 1863). B. *Mentzelia cordata* Kellogg (= *Ecnide cordata* (Kellogg) Kellogg ex Curran; from Proc. Calif. Nat. Sci. 2:opposite page 33. 1863).

interested in trees (Greene 1887). Indeed, one of Kellogg's major publications was a detailed account of the forest trees of California (Kellogg 1882). Greene (1887:151) noted that his last decade was largely devoted to illustrating trees and shrubs, of which more than 400 drawings "including all the oaks, all the coniferous trees, the poplars, many of the willows and ceanothi, dogwoods, and many herbaceous plants" were left with friends W.P. Gibbons and W. Harford to dispose of.¹⁴ Following his death, Kellogg's drawings of oaks were published by E.L. Greene as, *Illustrations of West American Oaks* (Greene 1889).¹⁵ At least five of Kellogg's original drawings survive in the Academy's herbarium (e.g., watercolor/pencil renditions of *Ribes nevadense*, *Viola purpurea*, and *Fritillaria viridea*, and pen and ink drawings of *Mertensia stomatechoides* and *Ribes menziesii*; see Appendix IV), but the fate of the bulk of them remains unknown. Parish¹⁶ and Jepson (Anonymous 1922) indicated that most of his drawings were destroyed at the time of the earthquake and fire in 1906. Indeed, Wilson (1955) also noted that Kellogg's drawings of California trees, which had been used by Eastwood to illustrate her book (Eastwood 1905), *A Handbook of the Trees of California*, had been lost in the fire.

Article 2, Section 1 of the Academy's original constitution stated that "Scientific gentlemen may be received as resident members." At the meeting of 1 August 1853, Kellogg moved "that we



FIGURE 5. Two Liliaceae named for Academy curators of botany. A. *Bloomeria aurea* Kellogg (= *B. crocea* (Torr.) Cov.), a genus named for Hiram G. Bloomer, drawn by Kellogg (from Proc. Calif. Acad. Nat. Sci. 2:opposite page 11. 1863). B. *Clintonia andrewsiana* Torr., a species named for Timothy L. Andrews (2007 photos by R. Kriebel from Butano State Park, San Mateo Co., California).

highly approve of the aid of females in every department of natural history, and that we earnestly invite their cooperation" (Hittell 1997:21). Kellogg's motion carried¹⁷ and, as noted by Miller (1942:368), "the first scientific institution in the West became probably the first in the world to recognize and encourage the ability of women in the scientific and intellectual sphere, as it was later the first institution to appoint women curators of its scientific collections." The importance of Kellogg's gesture should not be underemphasized. Notwithstanding considerable historical and sociological implications, the ramifications of Kellogg's motion, for the Academy in general and for the Department of Botany in particular, have been profound.

Kellogg remained active in the affairs of the Academy until he, the last surviving charter member of the organization, died in 1887. Kellogg has been described as possessing a particularly genial nature, and as being much admired and loved (Ewan 1953). Bosqui (1952:55–56) reminisced that "Dr. Albert Kellogg was the shining light of the Academy from its beginning. He was a thorough naturalist in the broadest sense of the word, a devoted and enthusiastic worker, and my earliest and most pleasant recollections are of him." George Davidson (1889:v), Kellogg's friend and Academy colleague, waxed poetic of their joint field trip to Alaska in 1867: "we lived in the same con-

tracted temporary deck cabin for four or five months under many trials and inconveniences, and the sweetness of his character was as pervading and refreshing as the beauty and fragrance of the flowers he gathered." Although he has been considered as the first resident botanist in central California (Thomas 1961a), like his colleagues at the young Academy, he was not a professional botanist,¹⁸ but a lover of nature with a remarkably inquisitive mind. The esteem in which he was held by his colleagues (and in consideration of his poor financial state and services he had freely furnished to the institution) is evident by their cancellation of his unpaid dues and awarding him a life membership in 1866 (Hittell 1997:80). With his gentle and unassuming manner, Kellogg made significant botanical discoveries in his adopted state, spurred the early growth of the first scientific institution in the West, influenced many of the early naturalists who were drawn to the Academy, demonstrated an early interest in conservation, and opened a new career path to women. Further insights into Kellogg's life and work were provided by Brandegee (1893a), Greene (1887), Ewan (1955), Ertter (2000), and others cited in these publications.

During the first decades of the Academy's existence, other naturalists at the institution also had botanical interests. The Academy's first president, the unfortunate Andrew Randall who was murdered in 1856, had maintained "an extensive collection of California plants, woods of native forest trees, mosses from New Mexico and the Gila country....," which the institution purchased from his estate (Hittell 1997:49).

Another of the Academy's original seven founders, John B. Trask (1824–1879; Fig. 1D) was keenly interested in botany.¹⁹ He was born in Roxbury, Massachusetts, studied at Yale College, and was widely trained or accomplished in several scientific disciplines (e.g., medicine, chemistry, geology, paleontology, and botany). Trask arrived in California during the Gold Rush of 1849 as part of a group led by John W. Audubon, son of the famous ornithologist. At the Academy, Trask served at various times as curator of several disciplines (though apparently not including botany), recording secretary, second vice-president, and first vice-president (Hittell 1997). As the first state geologist of California his reports contain references to the soils and spontaneous vegetation of various regions of the state (Jepson 1934). He collected plants in California and was particularly interested in the economic and medicinal attributes of western North American plants (Stearns 1908; Jepson 1934). For example, at the members meeting of 2 May 1864, Hittell (1997:71) noted, "Dr. Trask stated that in a recent case he had tried the roots of *Aspidium argutum* [sic; = *Dryopteris arguta* (Kaulf.) Maxon], recommended by Dr. Behr at a recent meeting as a remedy for tape-worm and with complete success. He had used five drachms of the grated root in two doses, four drachms being first administered and in an hour afterwards one drachm more. The proper effect was produced in four and a half hours without griping or nausea. It was stated that the plant was abundant in swamps; but that hogs were rapidly destroying it. Dr. Cooper said that the Indians of Oregon used the root as medicine. Dr. Trask turned the discussion to ferns and said that in the mines the young shoots of a species of fern has been much used as a pot-herb; that it resembles asparagus; boiled easily and was nutritious."

William P. Gibbons (1812–1897; Fig. 1C), a charter member of the Academy, was also interested in botany. Gibbons was born in Wilmington, Delaware and graduated with a medical degree in 1846 from the University of New York City in 1846. He had broad interests in natural history, and at the Academy he attended meetings and took an active interest in the institution's proceedings (e.g., serving as corresponding secretary in 1853–1855, curator of geology and mineralogy in 1855). After arriving in San Francisco in 1853, he practiced medicine and pursued botanical interests in various parts of the state. After being removed from the office of corresponding secretary in 1855, Gibbons disassociated himself from the Academy for a time, but eventually became involved with the organization again, and was once again elected to membership in 1866 (Hittell 1997). In

1863, he settled in Alameda. He was very much interested in medicinal plants and served as chairman of the committee on botany of the California State Medical Society. Jepson (1897) provided a biographical sketch of Gibbons.

Dr. Timothy L. Andrews (1819–1908; no known photo) was elected the Academy's curator of botany in January 1855. Andrews was born in Danbury, Connecticut and received an M.D. degree from Castleton (Vermont) Medical College in 1845. After stints teaching school and practicing medicine, he arrived in San Francisco in 1849. During his time in California, he served as a customs inspector, assistant editor of *The Pacific* newspaper, and school teacher (Anonymous 1906; Barnhart 1965; Starr 1926). Soon after his arrival in California, Andrews relocated to Monterey where he opened a school and collected plants. Of his time there Andrews noted, "I spent every leisure hour gathering the new and beautiful flora of this newly acquired territory. The whole surface of the country seemed carpeted with flowers. Never had I conceived such beauty. It was perfectly enchanting" (quoted in "Ames Plant Exhibit" in the *Evening Times-Republican* of Marshalltown, Iowa on 14 October 1902).

Hittell (1997) reported that Andrews attended the second meeting of the Academy on 11 April 1853 and was listed as one who would become a resident member of the Academy upon signing the constitution and paying the membership fee. Andrews also served as the Academy's recording secretary in 1854, and in July of that year he was appointed to a committee to investigate land in Alameda County that was offered to the Academy for establishment of a botanical garden (Hittell 1997).²⁰ Brewer (1880:557) noted that Andrews "made considerable collections, mostly near Monterey, beginning about this time and extending over several years. Some went to the California Academy of Sciences, some to Dr. Torrey, and Dr. Newberry had others."²¹

For unknown reasons, Andrews departed San Francisco in March 1855 and returned to the eastern United States. There is no evidence that Andrews intended to remain in San Francisco or California for an extended period and his departure was perhaps not altogether unexpected. Indeed, he appears to have arrived there somewhat by circumstance to begin with. By June of 1855, he was in Marietta, Ohio whence he wrote to John Torrey several times during the summer and fall of that year. His letters reveal that he was forwarding specimens from California to Torrey, seeking to procure literature on Californian plants, and discussing Kellogg's botanical conclusions.²² In spite of his apparent infirm health, Andrews' subsequent peregrinations (primarily in the Midwestern United States) included employment as a journalist, farmer, and physician. Although his name does not figure prominently in botanical literature, the study of botany and plant collecting were life-long interests of Andrews. His personal herbarium of several thousand specimens was given to Ames Agricultural College (now Iowa State University) in 1903.²³ There being no known image of Andrews, one of the California plants named in his honor is shown in FIGURE 5B.

At the meeting of 2 April 1855, Andrews was apparently replaced as curator of botany by the German-born physician and naturalist Hans H. Behr (1818–1904; Fig. 1B) (Hittell 1997).²⁴ Behr had departed his native country as a result of his participation in the Revolution of 1848, which sought to establish a liberal and unified Germany. Prior to coming to California in 1851, Behr's travels and explorations had taken him to Australia, the East Indies, the Philippines, South Africa, and South America. He settled in San Francisco where he took up medical practice and taught classes at the California College of Pharmacy.²⁵ In 1854 Behr joined the Academy where his training, experiences, broad scientific knowledge, as well as his personal copy of Endlicher's *Genera Plantarum*, added significantly to the institution's scientific credentials and resources (Ewan 1955; Gutzkow et al. 1905). Although he served as a curator of botany in 1855, Behr is probably best known for his entomological (specializing in Lepidoptera) work at the Academy, where he became the first curator of entomology in 1862 (Hittell 1997). His major botanical contributions were two

local floras (Behr 1884, 1888) based on his extensive collecting in central California (Thomas 1969). His *Flora of the Vicinity of San Francisco* (Behr 1888) was designed for students in his classes. In addition to describing several new plants, sometimes with Kellogg as co-author, Behr published his reminiscences of botanical "observations and experiences" from "the earlier days" of San Francisco in two articles (Behr 1891, 1896). His recollections of plants, habitats, and vegetational changes in the vicinity of San Francisco provided important details and records of that city's plant life in the nineteenth century (Howell et al. 1958). Behr's plant collections in the Academy's herbarium were mostly destroyed in 1906, but duplicates of many of them presumably survive at herbaria in Hamburg, St. Petersburg, and other cities to which they were sent (Ewan 1953). The genus *Behria* (Liliaceae) was described by E.L. Greene in his honor. Additional information on Behr's life and botanical activities was provided by Gutzkow et al. (1905), Ewan (1953), Legge (1953), and Ertter (2000).

Hiram G. Bloomer (1821–1874; Fig. 6A) was born in Marlborough, New York and educated at Newburgh College. In 1849, at age 28, he attempted to join the California Gold Rush, but became ill in Panama and subsequently returned to New York. He eventually arrived in San Francisco in 1850 and became a resident member of the Academy in October 1853. He regularly attended (and sometimes lectured before or presided at) meetings of the Academy, purchased and donated botanical books to the Academy's library,²⁶ and collected and presented many plant specimens to the herbarium. (Bloomer had collected in Panama during his first and unsuccessful attempt to travel to San Francisco.) Once settled in San Francisco and at the Academy, he collected plants in California and Nevada (Richardson 1970). He served as the Academy's recording secretary in 1854; he was elected curator of botany in 1856 and apparently served in that capacity until 1863 (Jepson 1899; Thomas 1961a; Hittell 1997).²⁷

Bloomer's only known publication (Bloomer 1868) is a brief note defending the priority of the work by his colleagues, Kellogg and Behr, on the "Big Tree" or Sierra redwood (*Sequoiadendron giganteum*).²⁸ After a decade of botanical activity at the Academy, Bloomer was able to report in 1863 that the botanical collection consisted of "6,150 specimens in fair condition" (Hittell 1997:62). He was elected director of the museum in 1868, and served in that role until his untimely death in 1874.²⁹ Perhaps his most far-reaching contribution to the Academy was introducing philanthropist James Lick to science and to the institution (see below).

Following his death, Bloomer's library and personal botanical collection were purchased by the Academy from his family for \$700 (Hittell 1997:177). Jepson (1899) noted that specimens collected by Bloomer (with his handwritten labels) were present in the herbarium, but that Bloomer's personal herbarium, which consisted of several thousand specimens, was reported as "lost" at the Academy. A handwritten catalogue of the Bloomer herbarium survived the loss of the specimens, but was presumably destroyed in the San Francisco earthquake and fire of 1906. Although there is only one extant Bloomer collection among the botanical types in the Academy's herbarium (Fig. 7C–D), duplicates of Bloomer's collections had been sent to Asa Gray at Harvard and other botanists (Ewan 1953). Bloomer's major botanical interest was the Liliaceae, and he cultivated many native species of lilies in his garden (Jepson 1899). Kellogg, who also had an interest in lilies, named the genus *Bloomeria* (Liliaceae) in honor of his friend and Academy colleague (Fig. 5A). Jepson (1899) and Richardson (1970) provided biographical sketches of Bloomer, from which much of the above information has been drawn.

William G.W. Harford (1825–1911; Fig. 6B), a native of New York, came to California in 1853, and was greatly influenced by Kellogg. He was elected as a resident member of the Academy in 1866. Although his primary biological interest was in conchology (he became curator of conchology at the Academy in 1867), he was very much interested in California's plant life. As previ-

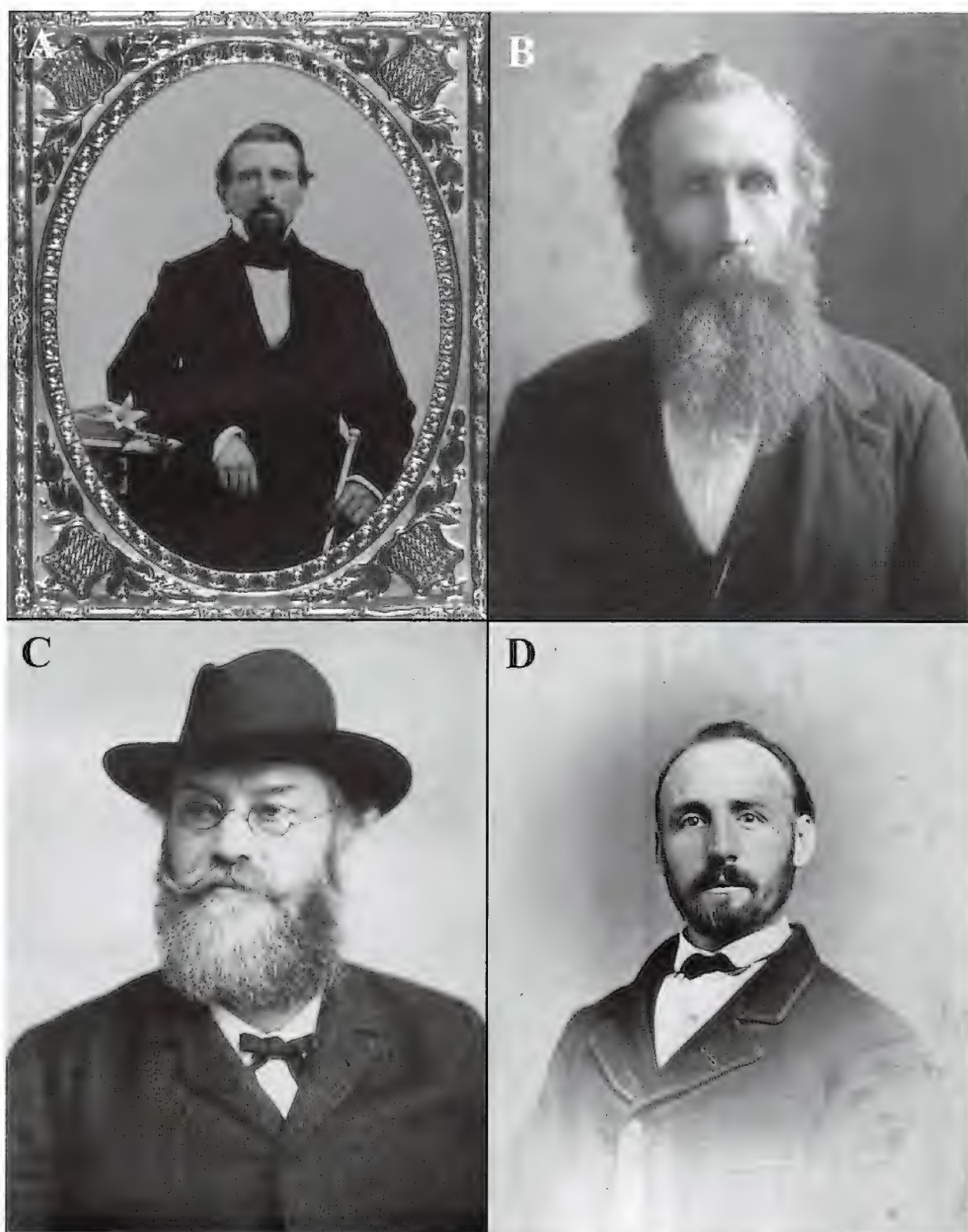


FIGURE 6. Early Academy botanists. A. Hiram G. Bloomer (undated photo, CAS Special Collections). B. William G.W. Harford (1901 photo, CAS Special Collections). C. William H. Brewer (undated photo, UC Herbarium Archives). D. Henry N. Bolander (1864 photo, UC Herbarium Archives).



FIGURE 7. Early Academy plant collections II. A-B. Bolander's isotype collection of *Rudbeckia californica* A. Gray, one of several putative "original" collections from the California State Geological Survey. C-F. Bloomer's holotype collection of *Eritrichium commatifolium* Kellogg (= *Plagiotothrys chorisianus* (Cham.) Johnst.).

ously noted, he accompanied Kellogg and Davidson to Alaska in 1867. In 1868 and 1869, Harford and Kellogg distributed large sets of their plant collections from California and Oregon to various herbaria (e.g., those of Engelmann, Torrey, and Gray, as well as European herbaria; Jepson 1933, Ewan 1953). In temperament, Harford has been described as being even more shy and retiring than his good friend Kellogg (Ewan 1953). He served as director of the Academy's museum from 1876–1886 (Ewan 1953). Greene and Parry named *Harfordia*, a genus of Polygonaceae, in his honor.

The California State Geological Survey was established by the state's legislature in 1860 to survey the region and to prepare a report containing "a full and scientific description of its rocks, fossils, soils, and minerals, and of its botanical and zoological productions" (Whitney as quoted by Hittell 1997:65). Included among its members was William H. Brewer (1828–1910; Fig. 6C), a chemistry professor with knowledge of agriculture, who filled the role of the Survey's botanist from 1860–1864. With its headquarters in San Francisco, members of the Survey became active in, and to some extent reinvigorated, the California Academy of Sciences (Hittell 1997). Indeed, Brewer became both a resident member and recording secretary of the institution in 1862. Brewer presented several papers to the Academy, but became less involved with the institution (and was replaced as recording secretary in 1865) as more of his time was "engrossed by the State Geological Survey" (Hittell 1997:74). Brewer left the Survey in 1864 and took up a professorship at Yale University. His field notes are preserved at Harvard's Gray Herbarium and his journal was published in 1930 as, *Up and Down California in 1860–1864* (Farquhar 1930).

Another German-born botanical enthusiast, Henry N. Bolander (1831–1897; Fig. 6D), arrived in San Francisco in 1861. Trained as a Lutheran clergyman, and a schoolteacher by profession, Bolander had already botanized in the midwestern United States. In Ohio, he had been influenced by bryologist Leo Lesquereux, and was to maintain a life-long interest in mosses (Ewan 1953). He came to California with hopes that the climate would be beneficial to his health (Jepson 1898). He soon became acquainted with Kellogg, Behr, Bloomer and others at the California Academy of Sciences, and collected specimens in the vicinity of San Francisco. His name first appears in Academy records at a meeting in 1862; he was elected curator of botany from 1865–1867 and again in 1871; he was corresponding secretary in 1866 and 1868 (Hittell 1997).

With Brewer's resignation from the State Geological Survey in 1864, Bolander was selected to succeed him as botanist of the Survey.³⁰ In this capacity he collected fungi, lichens, algae, bryophytes, and vascular plants in many regions of California (Jepson 1898, Ewan 1953) and his specimens were widely distributed (Thomas 1961a). The Survey suffered from continual financial setbacks. In 1867, Bolander noted that he, Kellogg, and Behr had withdrawn from taking part in the Survey's activities because of the poor treatment accorded its director, J.D. Whitney, by the state's lawmakers (Leviton and Aldrich 1997).³¹ A set of the Survey's plant collections was originally intended for the Academy's herbarium (Ewan 1955), and many (or all) of Bolander's collections were certainly deposited there (*cf.* Curran 1885), but it is not known to what extent Brewer's collections were deposited at the institution. Among the type collections currently extant at the Academy, there are collections of Bolander and Brewer (Figs. 3C–D, 7A–B).³²

One of Bolander's major botanical interests was Poaceae; he often presented papers on grasses at Academy meetings and he published several contributions concerning that family in the Academy's *Proceedings*. Bolander's (1870) *A Catalogue of the Plants Growing in the Vicinity of San Francisco*, was the first comprehensive listing of plants from the San Francisco Bay Area. About 1,300 species were recorded from an area centered on San Francisco, but including localities in Contra Costa, Monterey, Napa, and Sonoma counties.

Following his departure from the Survey, Bolander continued to collect plants throughout Cal-

ifornia. He had become a teacher in San Francisco schools in 1866, and upon being elected State Superintendent of Schools in 1871, he took advantage of his travels in that capacity to augment his botanical collections (Jepson 1898). Indeed, while associated with the Academy, Bolander corresponded and exchanged plants with botanists in many distant parts of the world. These exchanges greatly increased the number of foreign plants in the herbarium, at very little cost to the institution (fide H.N. Bolander archives, C.A.S. Special Collections).

Bolander's last recorded interactions at Academy meetings were in 1874 (Hittell 1997). He departed California in 1878 for extensive foreign travels (e.g., Guatemala), and he settled in Portland, Oregon upon his return to the Pacific Coast in 1883 (Jepson 1898). In a sad note to John Lemmon dated 12 August 1889, Bolander wrote from the Bishop Scott Academy, "A Boarding and Day School for Boys," in Portland: "I have not been able to do anything in a study I loved more than any other. Envy and hatred cut me down and condemned me to inaction. But in spite of all this, Science is Science, and Botany is Botany and whosoever promotes it, has my heartfelt sympathies" (John and Sarah Lemmon Collection, archives of University and Jepson herbaria, University of California, Berkeley; information supplied by R.G. Beidleman). Asa Gray named a genus of Saxifragaceae, *Bolandra*, in his honor. Jepson (1898) and Conmy (1958) provided biographical accounts of Bolander that focused, respectively, on his botanical and educational endeavors.

Gustavus A. Eisen (1847–1940; Fig. 8A) was born and educated in Sweden, came to the United States in 1872, and joined the Academy in 1874 (Ewan 1953). There, he was a prominent zoologist, but like so many other nineteenth century naturalists, his interests were myriad and included botany, horticulture, helminthology, archaeology, and geology. Although he is not known to have served as curator of botany, he was listed as curator of biology in 1897 and apparently as curator of invertebrate zoology in 1900 by Hittell (1997). The papers he presented at Academy meetings were sometimes on botanical topics (Hittell 1997). Eisen had a longtime interest in the cultivation and promulgation of the Smyrna variety of edible fig (*Ficus carica*). In 1901, he published an important treatise on the history, varieties, culture, and curing of edible figs (Eisen 1901). He collected plants in California; he participated in Academy expeditions to Baja California in 1892, 1893, and 1894 (Ewan 1953); and he donated a number of botanical books to the Academy in 1891 (Hittell 1997). *Eisenia*, a genus of algae, was named by J.E. Areschoug in his honor.

Harvey W. Harkness (1821–1901; Fig. 8B) was born in Pelham, Massachusetts and received a degree in medicine from the Berkshire Medical College of Massachusetts in 1847. After an overland journey, he arrived in California in 1849 where he practiced medicine until his retirement in 1869. He was first elected to membership in the Academy in 1871, to the vice-presidency in 1878, and the presidency in 1887.³³ Harkness served as curator of fungi in 1896 (Hittell 1997), and his botanical studies and Academy presentations were devoted primarily to fungi (especially truffles) of the Pacific Coast.³⁴ He published numerous papers concerning fungi in the Academy's *Bulletin* and *Proceedings* between 1884 and 1899. In 1891 he donated his personal collections (containing more than 10,000 specimens, including many fungal types as well as specimens acquired by purchase and exchange) to the Academy's herbarium (Anonymous 1891a; Hittell 1997).³⁵ Two genera of fungi, *Harknessia* M.C. Cooke and *Harknessiella* P.A. Saccardo, commemorate the Academy's best known mycologist. Additional biographical information about Harkness was published in Hittell's manuscript (1997) and in *Zoe* (Anonymous 1891a).

Justin P. Moore (1841–1923; no known photo)³⁶ was very active in affairs of the Academy for many years. Moore was born in Augusta, Maine, but little is known of his early years. It is probable that he was the Rev. Justin P. Moore, a seminary graduate, who was sent by the Congregational Home Missionary Society to Benicia in October 1865. In Benicia (on the northern shore of the Carquinez Strait to northeast of San Francisco) Rev. Moore held services and established a Con-



FIGURE 8. Early Academy scientists. A. Gustavus A. Eisen, (ca. 1910 photo by P.S. Bruguere, CAS Special Collections). B. Harvey W. Harkness (undated photo, CAS Special Collections).

gregational church (Anonymous 2000). Moore was elected a resident member of the Academy in 1875, curator of botany in 1882, and first vice-president in 1880–1883 and in 1886 (Hittell 1997).³⁷ His election to office in 1886 was accompanied by internal political divisions at the Academy. He resigned the vice-presidency in October 1886 and subsequently dropped out of Academy activities.³⁸ He was listed as an individual donor to the institution following the 1906 earthquake and fire (Leviton and Aldrich 1997), however, and some of his botanical books were presented to the Academy in that year as well.

Moore's interests were varied, but among botanical pursuits, he concentrated on fungi. He presented papers at the Academy concerning "parasitic plants," the "relations of fungi to disease," truffles, edible fungi, parasitic fungi, and cave fungi (Hittell 1997). With Harkness, he co-authored an important early treatise on fungi of the Pacific Coast (Harkness and Moore 1880). According to a letter from his widow to Alice Eastwood, the greater part of his collections "were gathered in Marin County...We lived in San Rafael for 19 years, and every Sunday Mr. Moore and a friend went far afield . . . seeking new specimens."³⁹ Moore resigned his Academy membership in 1889, stating that, "I do not feel that I can at present afford the nec'y expense" (letter from Moore to the Council of the Academy dated 10 January 1889 and preserved among G. Davidson papers at the Bancroft Library of the University of California, Berkeley). For the last nearly 20 years of his life, Moore was librarian and assistant secretary of the Fire Underwriters Association of the Pacific⁴⁰ (3 January 1934 letter from C.D. Moore to J.H. Barnhart, copy in Eastwood archives, C.A.S. Special Collections).

Other plant enthusiasts were affiliated with the Academy in some way during the latter half of the nineteenth century, usually as members, and often contributed specimens to its herbarium, presentations to its meetings, and manuscripts to its publications. Included among them were: Joseph LeConte (1823–1901; see Stephens 1982; Beidleman 2006), John G. Lemmon (1832–1908; see Crosswhite 1979; Beidleman 2006), Sarah A. Plummer (1836–1923; see Crosswhite 1979; Beidle-

man 2006), and Charles C. Parry (1823–1890; see Ewan 1950; Beidleman 2006). The collections and scientific publications of the earliest Academy curators and botanically oriented members, and the dissemination of these resources to botanical centers elsewhere in the United States and Europe, contributed greatly to the early knowledge of plant life in California and to the recognition of the California Academy of Sciences as a credible scientific institution.

II. FIRST FEMALE CURATOR OF BOTANY (1883–1894)

Mary Katharine Layne (1844–1920; Fig. 9A) was born in western Tennessee,⁴¹ and from there, her family moved continually westward before settling in El Dorado County, California. At 22, she married Hugh Curran of Folsom who died in 1874. In 1875, the 31-year old widow entered medical school in San Francisco. Female students were few in number at that time and they were not greeted with “open arms” at the University of California’s medical school (Ertter 2000). While there, she came under the instruction and influence of Behr (who, as noted above, taught classes at the California College of Pharmacy, which became part of the University of California’s medical school shortly after its founding in 1872). Curran received her medical degree in 1878 but, for unknown reasons, was not successful in establishing a medical practice.⁴² Encouraged by her former instructor, Behr, she spent more time at the Academy and was elected a member in 1879, only one year after the first women were elected to membership—finally putting into effect Kellogg’s resolution of 1853.⁴³ At the Academy, she continued her botanical training by working with Academy botanists, especially Kellogg and E.L. Greene (Setchell 1926; Jones 1929). With her spare time, she made herself useful in the herbarium, which she found to be “in a shocking condition” (quoted in Setchell 1926:167). She began to collect plants in 1881, and in 1883, she was appointed to a curatorship in botany and given a “salary” of \$40 per month (Hittell 1997).⁴⁴

From the beginning of her curatorship at the Academy, Curran was active in collecting plants, reorganizing and generally improving the Academy’s herbarium, and presenting papers to the membership (Setchell 1926; Thomas 1961a; Twisselmann 1967; Hittell 1997). She was also instrumental in providing publication outlets for scientific papers. She was influential in instituting the *Bulletin of the California Academy of Sciences*,⁴⁵ for which she served as acting editor (Setchell 1926; Hittell 1997), and later the private journal *Zoe*, which allowed for “freer scope to discussion and criticism” and which “was begun for me by Mr. Brandegee and Dr. Harkness” (quoted in Setchell 1926:168).⁴⁶ She also became editor of the newly revived *Proceedings* in 1888 (Hittell 1997).⁴⁷ Her article in the first volume of the Academy’s new *Bulletin* was an important list of plants described from California by her predecessors Kellogg, Behr, and Bolander (Curran 1885). In it, she attempted to “identify” these species and match them to pertinent and extant materials in the herbarium.

Edward L. Greene (1843–1915; Fig. 10) is best known as the first professor of botany at the University of California (from 1885 to 1895), but he was previously affiliated with the Academy, first as a member (1874) and subsequently as a curator of botany (1884–1887). Greene was born in Hopkinton, Rhode Island and developed a lifelong interest in plants as a small child. After receiving a bachelor’s degree from Albion Academy, he was a schoolteacher for several years (McIntosh 1983). Greene first came to California in 1874 from Colorado where he had become an Episcopalian clergyman, but his true calling was collecting plants. He came to know the Academy and its botanists during the year or so that he fulfilled his ministerial duties in Vallejo (Ewan 1953).

Following pastoral stints in Colorado and New Mexico, in 1881 Reverend Greene took a position at St. Mark’s Episcopal Church in Berkeley and began to make extensive use of the Academy’s herbarium in connection with his botanical avocation (Ewan 1953). There he worked along-



FIGURE 9. A. Mary Katharine Layne (Curran) (Brandege) (undated photo, UC Herbarium Archives). B. Townshend S. Brandege (undated photo, UC Herbarium Archives).

side Curran and presented papers at the Academy's meetings. In 1885 Greene took up duties at the University of California but continued to spend time at the Academy's herbarium. After assuming his professorship in Berkeley, Greene was twice reappointed curator of botany at the Academy, served on the organization's publications committee, presented papers at members' meetings, and contributed to the Academy's publications (Hittell 1997).

After a decade at the University of California, Greene moved to Catholic University in Washington, D.C. His personal herbarium was ultimately deposited at the University of Notre Dame. Numerous accounts of Greene's life and botanical work have been published (listed by Thomas 1969; see also Constance 1978; McIntosh 1983; McVaugh 1983; Ertter 2000; Beidleman 2006), and Kistler (1936) provided a bibliography of his botanical writings.⁴⁸ Kuntze named the genus *Greeneina* (Moraceae) in his honor.

The brief period during which the minister



FIGURE 10. Edward L. Greene (undated photo, UC Herbarium Archives).

and the former physician were prominent botanists at the Academy must have been a fascinating time. They appear to have been supportive of one another in their botanical efforts and they even conducted fieldwork together (Ertter 2000). Not only was Kellogg still active at this time, but mycologists Moore and Harkness and Curran's mentor, Behr, were so as well. In fact, Moore and Curran were both curators of botany in 1883; and Greene and Curran were both curators of botany from 1884–1887. With Greene's departure to the University of California and the deterioration in their opinions of one another's abilities (see below), both Curran and Greene came to play prominent roles in California's botanical politics. From 1888–1889, Curran and Hasbrouck Davis were both curators of botany; and in 1890, she⁴⁹ and Volney Rattan were jointly curators of botany.

Hasbrouck Davis was elected as a resident member of the Academy in 1887 (Hittell 1997), and he appears to have resigned his membership in 1890 according to unpublished archival files of the institution. These files also note that he was joint curator of botany for two years with Curran. His interests and activities remain unknown.⁵⁰

Volney Rattan (1840–1915; Fig. 11B) was born near Madison, Wisconsin, studied at the University of Wisconsin, and arrived in California in 1861. He became a schoolteacher and taught, successively, in Placerville, Santa Cruz, and San Francisco. He taught science at the Girl's High School in San Francisco from 1876 to 1889, and from 1889 to 1906 he taught botany at the California State Normal School in San Jose (all from Jepson 1928). He was elected to membership at the Academy in 1889 (Hittell 1997) and was listed as a curator of botany (along with K. Brandegee) for 1890 in unpublished archival records at the institution. He collected in central California, and his herbarium of about 2,000 specimens was acquired by Stanford University in 1904 (Thomas 1961a). He was author of several popular botanical textbooks, i.e., *West Coast Botany*, *Exercises in Botany for the Pacific States*, and *A Popular California Flora, or; Manual of Botany for Beginners*, the latter of which appeared in numerous editions.

The decade of 1875 to 1885 has been described as a time of internal dissensions at the Academy (Ewan 1955). As noted by Ewan (1955), University of California botanist (and Greene protégé) W.L. Jepson contended that Curran "engineered" these dissensions, whereas fellow Berkeley professor and phycologist W.A. Setchell perceived her actions as disinterested. Curran undoubtedly possessed a strong-willed personality, and she was apparently actively involved in internal Academy politics during her curatorial tenure at the institution.⁵¹ According to Academy member C.C. Parry (in a letter to S.B. Parish, quoted in Ewan 1955:32): "Acad[em]y affairs as you will infer are run *a la Curran* and nobody else has anything to say in the matter—Greene draws off to Berkeley—how long this state of things may last *quien sabe*. I enclose Harkness's inaugural written as I understand by Curran." Indeed, by 1884 the state of institutional affairs had deteriorated to the point that an Academy president later remarked, "Our herbarium was already nearly destroyed by insects and almost entirely useless for lack of classification" (O'Brien 1947).

Coincident with Greene's departure to Berkeley in 1885, Townshend S. Brandegee (1843–1925; Fig. 9B) arrived in San Francisco and according to Marcus E. Jones (Jones 1933:15), "Mrs. Curran fell 'insanely in love' with Brandegee, as she put it in a letter to her sister. It was surely a droll affair, a most intensely masculine woman desperately in love with the most retiring and effeminate man, and both of them dead in earnest about it..." Brandegee was born in Berlin, Connecticut to a prominent family. Although he studied some botany and worked in the herbarium at Yale, he graduated in civil engineering and went to Colorado as a surveyor. While there, and in other states, he took the opportunity to collect plants and send them to the major Eastern botanists (Setchell 1926). Soon after coming to California, Brandegee became an active member of the Academy and, as noted by Setchell (1926), the institution and its botanists influenced him to become more of a self-reliant scientist (e.g., publishing his own observations and data) than a mere



FIGURE 11. A. William R. Dudley (undated photo, Dept. Botany "biography files"). B. Volney Rattan (from *Madroño* 1:168, 1928).

collector for others. The availability of Brandegee's personal herbarium and library (Chickering 1989) was undoubtedly a significant resource for botanists working at the Academy. After becoming involved with the Academy and Curran, he often traveled to Baja California in order to collect and study plants in that botanically little-known peninsula. Although he also collected plants in much of California, parts of the western United States, and various regions of Mexico (Setchell 1926), he is best known for his extensive work in Baja California. Despite his being a member of the Academy (having been elected in 1889), corresponding secretary in 1893, and editor of volume two of the second series of the *Proceedings*, Brandegee was never a curator on the Academy's staff.

Curran and Brandegee married in 1889 (she becoming Mary Katharine Layne Curran Brandegee, often called "Kate;" and he being referred to as "Dolly," at least by his wife) and for their honeymoon, they made a collecting trip from San Diego to San Francisco, a distance of 500 miles, on foot! The botanical Brandegees (Fig. 12) would make additional walking trips to collect plants in their years together (Setchell 1926), but it is doubtful that any were of comparable length. With T. Brandegee's independent means,⁵² the couple was largely free from financial worries and founded the journal *Zoe* in 1890 (Fig. 29). According to Jones (1933), K. Brandegee was the "inspiration and the force" behind *Zoe*. The journal was also the major outlet for her botanical writings, and when it was discontinued in 1906, she published only one further paper.

In many ways the years 1890 and 1891 were pivotal in the history of botany at the Academy. In 1891, K. Brandegee finally became the organization's sole curator of botany. The Brandegees had founded *Zoe* in 1890, and in 1891 K. Brandegee helped to initiate and operate the California



FIGURE 12. Katharine and Townsend Brandegee, photo taken during visit to T. Brandegee's family in the eastern United States (CAS Special Collections and UC Herbarium Archives).

Botanical Club⁵³ of amateur plant enthusiasts and professional botanists. The goals of the Club (usually referred to as the "Botany Club") were to bring botanists of the Pacific Coast region closer together and partly to help fund *Zoe*. Also in 1891, the Academy moved into much needed new quarters on Market Street, a few blocks from Union Square in the heart of downtown San Francisco (Fig. 13A).⁵⁴ Thanks in part to Bloomer's efforts, philanthropist James Lick had given the Academy the land, and subsequently a portion of his estate allowing for the erection of two buildings. The one facing Market Street was rented to businesses in order to generate income for the institution and the one in the rear served as a public museum and a site for collections and research scientists on the upper floors. In the museum building, marble stairs led up from the open public court to tiers of rooms that opened onto balconies with brass and wrought-iron railings. The Department of Botany⁵⁵ and the Brandegees were on the sixth floor (Fig. 13B). During the move to the new facilities, the Brandegees became acquainted with a visiting Colorado botanist and former school-teacher, Alice Eastwood, who was making her first trip to the West's leading botanical center.

Katharine Brandegee's often caustic and sarcastic book reviews and comments about contemporary botanists (especially her former colleague, E.L. Greene) rival those of Marcus E. Jones.⁵⁶ Sometimes while praising the work of one botanist, she could not help but criticize another (e.g., see Thomas 1961a:153). Although Greene had been a close co-worker with her in her early days at the Academy, K. Brandegee's subsequent criticisms of his work are well known. Indeed, she published in *Zoe* a lengthy paper (Brandegee 1893b) highly critical of Greene's published botanical contributions. In reviewing Greene's (1894) *Manual of the Botany of the Region of San Francisco Bay*, she wrote, "The title should have been *A Phanerogamic Flora of — counties in the State of*

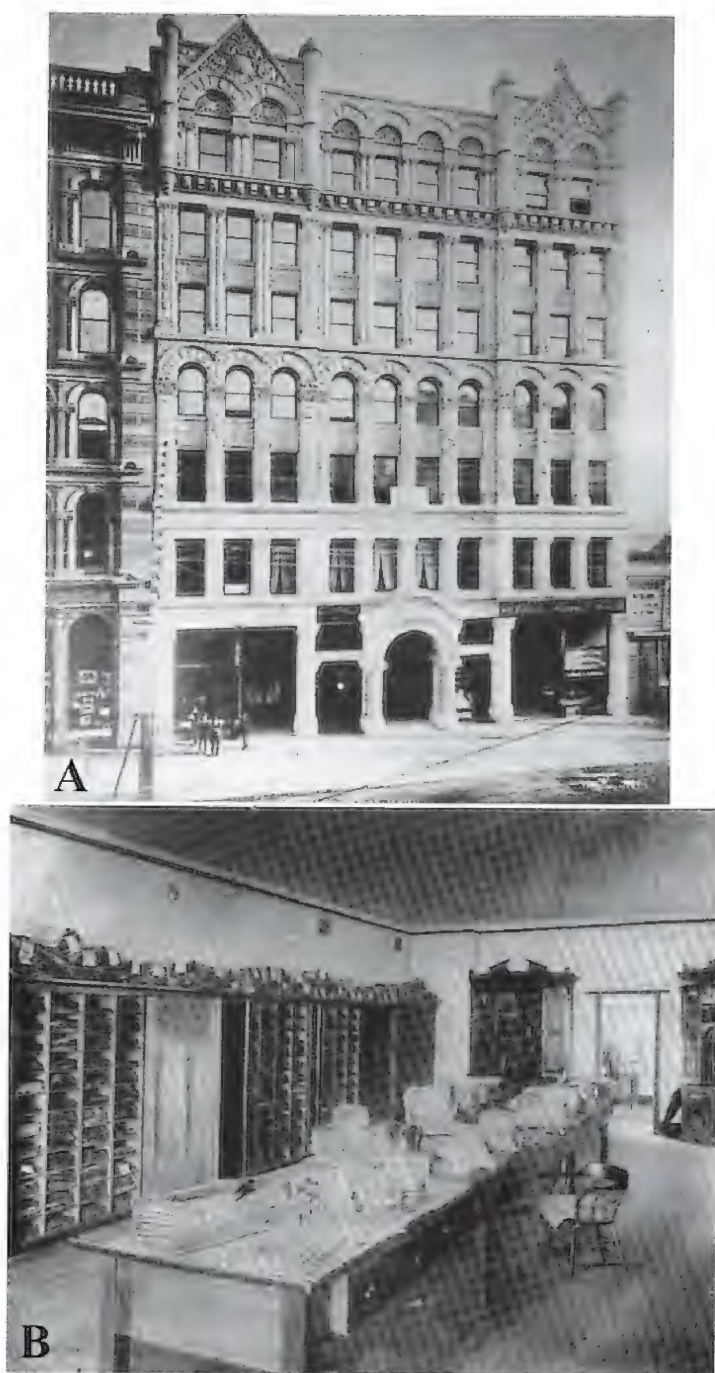


FIGURE 13. California Academy of Sciences complex. A. Academy's building on Market Street, between 4 and 5th streets. The estate of James Lick funded the Academy's commercial building on Market Street and an adjacent museum and collections building connected to and behind this one. The Department of Botany moved into the latter building in 1891 (1891 photo, CAS Special Collections). B. Herbarium on sixth floor of museum building, directly behind Market St. building (from *Californian Illustrated Magazine* 3(2):230. 1893, photo by C.F. Holder, CAS Special Collections).

California, omitting Typhaceae, Lemnaceae, Naiadaceae, Alismaceae, Juncaceae, Cyperaceae, Gramineae, Coniferae and numerous species in other orders; with thirty 'new species' none of which are new, and nearly all vaguely characterized both as to character and station; and with every change of name which the author's present knowledge admits" (Brandegge 1894:417).⁵⁷ Greene apparently returned her vitriol only in private, referring to her as a "she devil" (Jones 1933). It remains unknown whether the mutual antagonism between these prominent California botanists resulted from K. Brandegge's political maneuvering at the Academy as suggested by Jepson (1933) or were primarily the result of her critical nature toward scientific work that did not conform to her standards or ideas (Setchell 1926). Ewan's (1942) suggestion that her vitriolic criticisms of Greene were likely the result of unrequited love was denounced by Herre (1960). Whatever caused their mutual antagonism, it did not prevent them from interacting professionally and socially in their later years (Ertter 2000, *q.v.* for additional insight and speculation into their often stormy relationship).

Katharine Brandegge's botanical activities were confined almost exclusively to California (Thomas 1969), where she collected widely.⁵⁸ She was especially interested in the plants of San Francisco and published the first comprehensive catalogue of plants occurring in the county (Brandegge 1892a, 1892b). These activities complimented those of her husband, who collected primarily in Baja California following their marriage (Thomas 1969). Regarding their collecting habits, Twisselmann (1967:141) noted that "both of the Brandegges were careless collectors; any records unique with them must be viewed with suspicion as localities and dates are often obviously wrong." This sentiment is backed up by the errors and problems with labels noted by Ewan (1942). Ewan (1955:33) further noted that K. Brandegge recorded only the briefest data on specimen labels, "as if she intended to stymie another collector revisiting her station!"⁵⁹

Like her mentor Behr, K. Brandegge was an early Darwinist and proponent of experimental systematics (Ertter 2000). In her collecting activities, she paid careful attention to morphological variation and developmental stages of plants (Setchell 1926). Useful insight into her working methods and taxonomic philosophy was provided by Setchell (1926:166), undoubtedly gleaned from her post-Academy days in Berkeley: "Mrs. Brandegge had many projects in hand at which she worked most industriously, now at one, now at another. She accumulated much material in the way of fragments of types or other critical specimens already published upon and prepared many notes, but she brought little to completion. She was never satisfied with her efforts. She projected a flora of California but her ideas as to species were so broad at times that Mr. Brandegge sometimes humorously remarked that he thought that her flora would finally contain only a single species." K. Brandegge never completed the floristic account of California's plants that she was obviously in an ideal position to write, and because she depended largely on her memory, little of her knowledge survived her (Jones 1933).⁶⁰

Following their marriage in 1889, the Brandegges based their studies at the Academy for the next five years. The herbarium continued to grow. In 1893, it was reported that the collection was rapidly increasing in size, with at least 20,000 specimens having been added between January and July of that year (including the private collection of George Thurber⁶¹ (Anonymous 1893).

In 1894, the Brandegges relocated both themselves and their personal library and plant collections to San Diego where they built a private herbarium and botanical garden on a mesa above that city.⁶² Twelve years later, the Brandegges returned to the Bay Area shortly after the San Francisco earthquake in 1906.⁶³ They settled in Berkeley, donated their herbarium and botanical library to the University of California, and worked out of the herbarium there until their respective deaths (Setchell 1926).⁶⁴ After leaving the Academy, the Brandegges continued to collect plants⁶⁵ and publish botanical papers for many years to come. Setchell (1926) published adjoining biographies

(with autobiographical information included therein) and bibliographies of the Brandegees. Other biographical information on K. Brandegee was provided by Jones (1929, 1933), Crosswhite and Crosswhite (1985), Bonta (1991; who notes the presence of some of Brandegee's letters at the Field Museum in Chicago, the Gray Herbarium in Cambridge, and herbaria at the University of California in Berkeley), and Ertter (2000). Useful itineraries and gazetteers for the Brandegees were provided by Ewan (1942) and Moran (1952). The genus *Brandegea* Cogniaux (Cucurbitaceae) was described in honor of T. Brandegee.

III. EASTWOOD ERA AND A NEW BEGINNING (1891–1949)

It was during the move to the Academy's new, "fire-proof" quarters on Market Street in 1891 that a 32-year-old former schoolteacher and self-trained botanist from Colorado named Alice Eastwood (1859–1953; Fig. 14A) first visited the institution. Eastwood had come to meet T. Brandegee, whose botanical work in Colorado was well known to her, and to show him the plants that she had collected the previous year in southern California (Wilson 1955). Eastwood and the Brandegees became quick friends and field companions during trips in the San Francisco Bay area. Both Brandegees were sufficiently impressed with her that she was invited to return to San Francisco later in the year to help K. Brandegee organize specimens in the new herbarium facilities. She became a member of the Academy and the California Botanical Club in April 1892. Later that year, K. Brandegee encouraged Eastwood to move permanently to San Francisco and become joint-curator in the Department of Botany. The aspiring botanical writer accepted the offer and arrived in December



FIGURE 14. Alice Eastwood. A. Shortly after arrival in San Francisco (undated photo, CAS Special Collections). B. Standing by *Eastwoodia elegans* Brandegee at 79 years of age (1938 photo by J.T. Howell in Hospital Canyon near Tracy, CAS Special Collections).

1892. In order for Eastwood to be hired as joint-curator, K. Brandegee gave up her salary, which was then paid to her new colleague (Wilson 1955). This generous gesture toward a younger colleague would not be lost on Eastwood.

Eastwood was born in Toronto, Canada and spent her early years on the grounds of the Toronto Asylum for the Insane where her father was steward.⁶⁶ An interest in plants was initially nurtured by her uncle in his large garden and subsequently by a priest at a garden in the convent to which she had been sent when her father's business failed. At age 14, she moved to Denver, Colorado to rejoin her father. Following graduation from East Denver High School in 1879, Eastwood became a teacher and an avid naturalist during the summer vacations. She explored various parts of the state, collected plants, and taught herself basic botanical science. When her finances and real estate investments permitted a small independent income, she devoted herself entirely to botanical pursuits and hoped to become a botanical writer.⁶⁷

In 1894, when K. Brandegee retired from the Academy and moved with her husband to San Diego, Eastwood was left in charge of both the herbarium and the Botany Club.⁶⁸ To augment the Academy's botanical resources, she began collecting plants very soon after taking up her curatorship. Many of the costs of her early collecting trips came out of her \$75/month salary and her own independent personal income from property she owned in Colorado (Wilson 1955).⁶⁹ She collected throughout the Bay Area and farther afield in California.⁷⁰ As a result of her activities, the herbarium steadily increased in both size and value (MacFarland et al. 1949).⁷¹

From its beginnings organization of the herbarium seems to have been somewhat haphazard by current standards. In trying to identify species and locate type specimens of California plants described by her predecessors, Curran (1885) had noted that their material was often scattered and fragmentary and that the types of many species had disappeared from the herbarium. The apparent "loss" of Bloomer's herbarium (see above) probably also reflected poorly upon the organization and operation of the herbarium. Eastwood meticulously organized Harkness's fungal collections and mounted collections of vascular plants. In addition to increasing the plant collections, one of the many curatorial activities that Eastwood undertook was to begin separating types from the herbarium in the event of fire within the building. These were placed into a lightweight case that could be lowered out of a window in an emergency (Wilson 1955). Like her predecessor, Eastwood assisted with the editing of *Zoe* and later helped edit other journals (e.g., *Erythea*).

Eastwood lived in a loft on San Francisco's Nob Hill, and walking to work each day, she often collected the weeds that grew among the cobblestone streets. This activity ultimately led to a publication and a slight altercation with Willis Jepson, a former student of and successor to Greene at the University of California. Eastwood sent her paper, titled "A Flora of the Nob Hill Cobblestones," for publication in Jepson's journal *Erythea*. Prior to publication, and unbeknownst to her, he altered her title to, "The Plant Inhabitants of Nob Hill, San Francisco." This substitution was not appreciated by Eastwood, who made a hand-written annotation in her copy of the journal (Fig. 15A). She was not to be denied, and in her retirement many years later, she expressed herself in print when the paper was republished under her original title and with an explanation in her foreword (Eastwood undated; Fig. 15B). The relationship between Brandegee's handpicked successor at the Academy and Greene's former student in Berkeley was to remain civil, but they were hardly close colleagues.⁷² Indeed, Eastwood carried on a detailed and mutually respectful correspondence with Greene following his departure from the University of California (see Duncan 2006). Eastwood appears to have been somewhat more capable of making friends of those with whom she disagreed than her mentor and colleague K. Brandegee. Her many friends would become essential to her future in systematic botany and the Academy's herbarium.

On 18 April 1906, Eastwood was awakened shortly after 5:00 in the morning by an earthquake

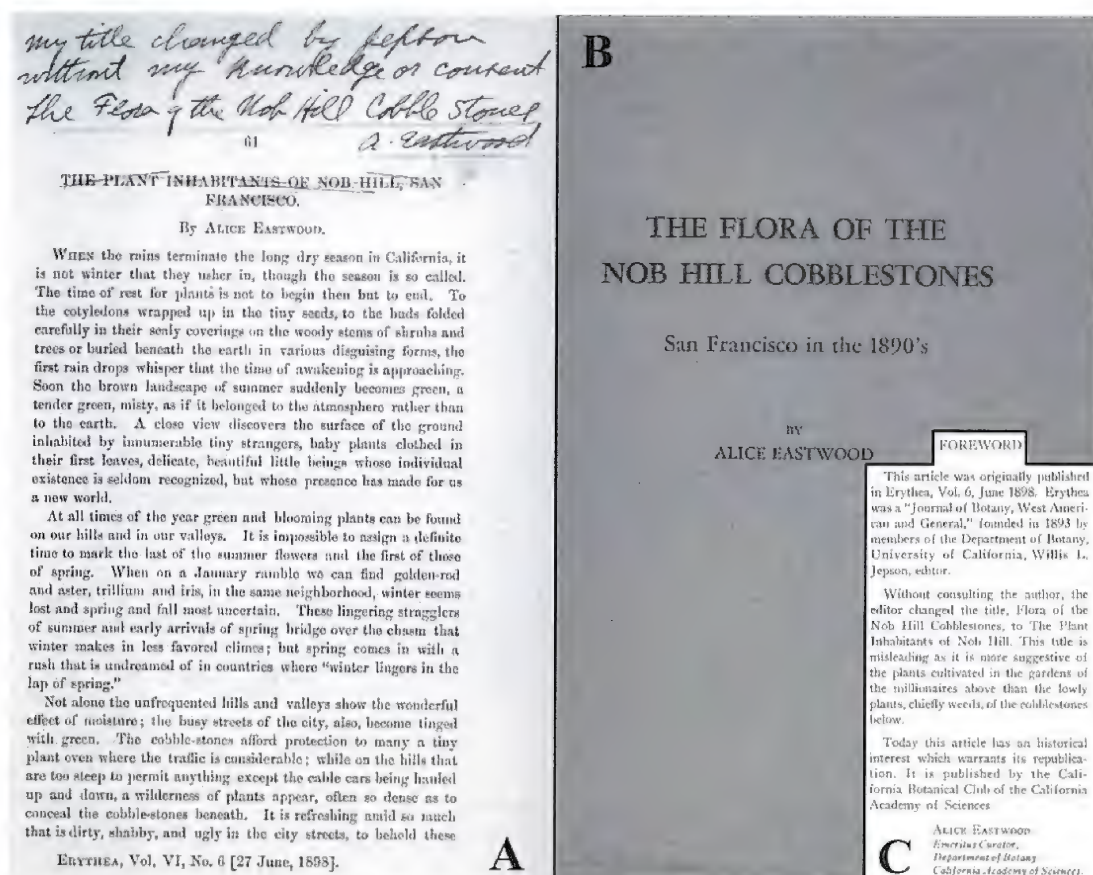


FIGURE 15. A. Eastwood's copy of the journal *Erythea* with her 1898 article on the plants growing among the cobblestone streets of Nob Hill (CAS Library). B. Eastwood's subsequent republication (with explanation in the foreword) of her article (Dept. Botany "biography files").

that shook San Francisco. Nob Hill is bedrock and little damage was sustained in her rented rooms. After eating breakfast and preparing a lunch, she started off for the Academy as usual. Approaching Market Street, the Academy's buildings appeared to be intact, but she could see fire coming up an adjacent street. The magnitude 8.3 temblor had broken the city's gas lines and water mains and fires were raging out of control. When she was finally able to get into the museum building with the help of a young friend, Robert Porter, whom she had encountered on the street, she found that the marble staircase leading up to the collections was largely destroyed. The iron railings were secure, however, and she and Porter made use of them to climb up to the herbarium on the sixth floor. The case containing the type specimens that Eastwood had been segregating from the herbarium during the previous year had been damaged by the earthquake and could not be evacuated as originally envisioned. So Eastwood placed specimens from the case into an old work apron, fashioned a cord from ropes and string (or curtains in one version) long enough to reach the first floor, and climbed back down the railings. Using the cord, Porter lowered the specimen-filled apron to Eastwood several times until all of the 1,497 specimens⁷³ that had been segregated were on the ground level. The only personal item that she saved was her Zeiss lens (Fig. 16A), which she slipped into her pocket. Eastwood and Porter located a wagon and driver that would carry the herbarium specimens and other items that had been gathered in the meantime by other Academy



FIGURE 16. Alice Eastwood. A. Curator Eastwood in the herbarium on her 80th birthday (1939 photo, CAS Special Collections). Curator Emeritus Eastwood at age 93 at Tilden Park (1952 photo by F.O. Pearse, CAS Special Collections).

staff. As fire approached the building, Eastwood climbed up on the wagon and directed the driver to the house where she rented rooms on Nob Hill. Behind her, in the bed of the wagon, was all that would remain of 53 years of botanical collecting and the largest herbarium in the western United States. The firestorm destroyed the Academy's buildings and their contents (Fig. 17).⁷⁴ Eastwood had to move the bundles of specimens twice more before they were finally safe from the spreading flames.⁷⁵ She ultimately had them transferred to the vault in the Crocker Bank for safekeeping (Wilson 1955). Her living quarters and most of her personal possessions did not survive the fires. In a letter to E.W. Nelson of the Smithsonian Institution (quoted in *Science* magazine of 25 May 1906), Eastwood wrote:

I do not feel the loss to be mine but it is a great loss to the scientific world and an irreparable loss to California. My own destroyed work I do not lament, for it was a joy to me while I did it, and I can still have the same joy in starting it again. The kindness of my friends has been great. I feel how very fortunate I am; not at all like an unfortunate who has lost all her personal possessions and home...

Looking back on the tragedy after more than three decades, then Academy director Robert Miller wrote (1942):

That anything at all was saved was due especially to Miss Eastwood, then as now [1942] the Academy's curator of botany, who lost all of her own possessions while attempting to save those of the Academy... It was justice in the most poetic sense that more than half a century after the Academy had voted to admit women to its activities, the book of minutes containing the record of that action, along with other documents and specimens of inestimable value, should have been saved through the energy and resourcefulness of a woman curator.

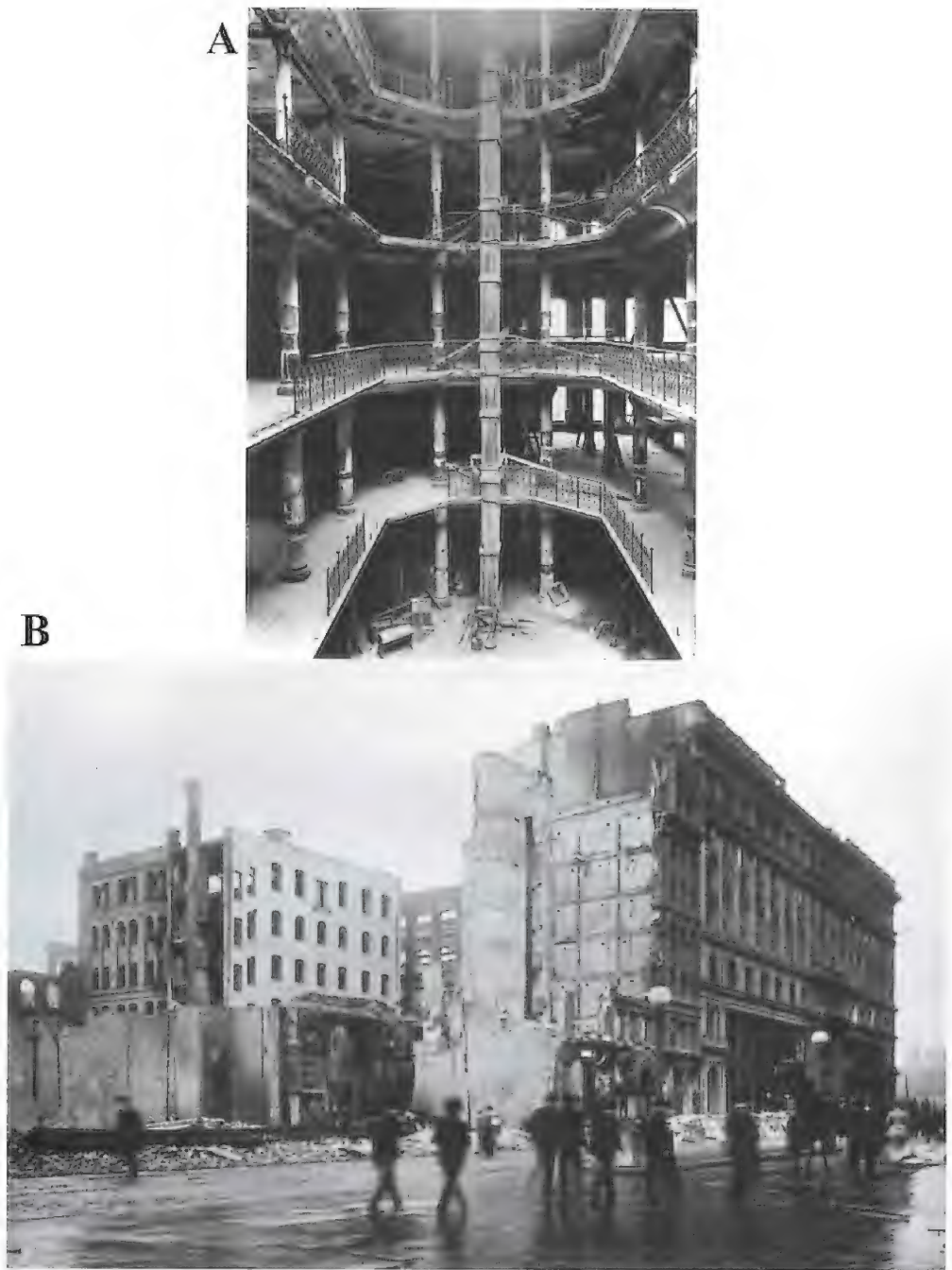


FIGURE 17. A. Interior of Academy's museum building in 1906 after the earthquake and fire but prior to demolition (1906 photo, CAS Special Collections). B. Academy's buildings from Market Street following the earthquake and fire, and during demolition (1906 photo by F. Anderson, CAS Special Collections).

The Academy's Department of Botany had been the center of botanical activity in California from its inception until its destruction in 1906. Prior to the San Francisco earthquake and fire,⁷⁶ the Academy's herbarium was the largest and most important in western North America. An inventory of the herbarium prepared in the mid-1890s (Anonymous 1896) indicated the presence of 74,767 total specimens.⁷⁷ Considering Eastwood's activities (see note 71 below), it is reasonable to suppose that by the time of the earthquake and fire in 1906 the herbarium contained at least 100,000 specimens.

After the destruction of the Academy, curators were advised to find alternate means of employment. For various periods, Eastwood accepted William Setchell's offer of working space at the University of California's herbarium.⁷⁸ Eastwood spent the decade after the earthquake and fire collecting plants (Fig. 18), traveling to domestic and foreign herbaria, working as an assistant at Harvard's Gray Herbarium, serving as the Academy's Assistant Librarian, and planning for a new Department of Botany at the Academy.⁷⁹ In spite of her activities, the future of the Academy and its Department of Botany were by no means secure. Some of Eastwood's doubts and concerns about the governance of the institution (especially its then director L.M. Loomis) were expressed in letters to her friend E.L. Greene (Duncan 2006). However, Eastwood's fears were assuaged by the Academy's longtime second vice-president Otto von Geldern who noted that although Loomis "has invariably fought the rehabilitation of this department," there would be a botanical department in the new Academy, and von Geldern expressed the hope that she would lead it (letter of 26 January 1911 from O. von Geldern to A. Eastwood in Department of Botany archives, Box 2, C.A.S. Special Collections). Indeed, in 1912, the Academy recalled Eastwood (Fig. 19) to San Francisco to begin rebuilding the herbarium in earnest (although she continued to travel and collect following her return).⁸⁰



FIGURE 18. Alice Eastwood collecting in ca. 1913, probably during trip to Warm Hot Springs in San Diego Co. (photo, CAS Special Collections).



FIGURE 19. Alice Eastwood (1912 photo by G. Eisen, CAS Special Collections).

In 1916, when the Academy reopened at its new home in San Francisco's Golden Gate Park, Eastwood was 57 years old. The specimens she had saved from the 1906 disaster, her own collections since that time, loans outstanding in 1906, donated collections from both domestic and foreign sources, and plants collected during the Academy's 1905–1906 expedition to the Galapagos Islands (Fig. 20)⁸¹ formed the nucleus of the new (and present) herbarium. With renewed vigor, she continued to rebuild the Academy's botanical resources, both in the herbarium and library. By 1918, the herbarium already contained 50,559 specimens.⁸² Under her leadership, the Botany Club provided volunteers to work as assistants in the herbarium and funds to buy books for the library. One of the selfless and continuing acts of Eastwood was the purchase, from her own resources, of books and serials (sometimes entire runs of important journals) for the library.

It is indicative of Eastwood's visionary philosophy that following the destruction of the largest collection of California plants in existence, she sought to establish a worldwide collection in its place. She remarked, "Looking forward to the future greatness of San Francisco, I wanted this new herbarium to be a great one, founded on a broad basis, a herbarium containing not only plants of North America, but of the whole world" (Eastwood 1952:205). Acquisition in 1920 of the Albert Prager Herbarium, a large and important private herbarium of plants from the Old World, was a major step in this direction.⁸³ Immediately outside of the new herbarium, she helped develop Golden Gate Park into a horticultural wonderland, where today some 8,000 species from nearly all regions of the planet are cultivated, mostly out-of-doors, on land that was previously sand dunes. To help ensure the success of the diverse plantings in Golden Gate Park, she taught classes in the evening for the Park's gardeners. Together with Park superintendent John McLaren, Eastwood successfully crusaded against destruction of the Park by proposed streetcar lines traversing it. She also



FIGURE 20. Crew of the Academy's 1905–06 Galapagos Expedition (with botanist Alban Stewart second from left) on the schooner *Academy* just prior to departure from San Francisco on 28 June 1905 (photo, CAS Special Collections).

founded and/or nurtured numerous floral and conservation organizations.⁸⁴ Meanwhile, her collecting activities throughout western North America continued unabated (Wilson 1955). By uniting these and other activities into a positive work ethic, and by benefiting from the generosity and assistance from her large circle of friends, she was enormously successful in rebuilding both the herbarium and botanical library.

At age 90, following 56 years of service to the Academy, Eastwood retired from her curatorship on her birthday (19 January) in 1949, and became curator emeritus at the institution (Howell 1954a, 1954b; Wilson 1955; Fig. 16). Specimens in the herbarium at that time numbered more than 352,000 (Miller 1949). Her botanical interests were of a general nature. This is amply reflected by her bibliography (MacFarland and Sexton 1949) of over 300 titles that includes technical botanical treatises, floristic studies, horticultural notes, ethnobotanical reports, historical accounts of botanical exploration, book reviews, and popular articles for a lay audience. Although she published articles on mushrooms, ferns, gymnosperms, monocots and dicots, she worked extensively with manzanitas (*Arctostaphylos*), lupines (*Lupinus*), Indian paint brushes (*Castilleja*), and numerous plants occurring on Mt. Tamalpais in Marin County. Undoubtedly, more has been written about Alice Eastwood than any other botanist affiliated with the California Academy of Sciences. Eastwood is commemorated in the genera *Aliciella* Brand (Polemoniaceae) and *Eastwoodia* (Asteraceae; Fig. 14B); the latter was described by the man she first came to San Francisco to meet, T. Brandegee. Additional biographical information on Eastwood is available in MacFarland et al. (1949), Dakin (1954), Howell (1954b), Gambill (1988), Bonta (1983, 1991), Rush (2003), Duncan (2006), and Leviton et al. (2006). Wilson (1955) published a detailed biographical tribute to Eastwood, from which much of the above information is derived. She also compiled a partial gazetteer and chronology of Eastwood's collecting localities (Wilson 1953).

Because of her enthusiasm for collecting plant specimens throughout the western United States,⁸⁵ her heroism in saving critical herbarium specimens from the fire following the 1906 earthquake, her perseverance in rebuilding the Academy's botanical resources, her generosity to numerous garden and conservation organizations, and her prodigious scientific productivity, Eastwood has taken on legendary status in the San Francisco Bay Area. Her accomplishments were indeed remarkable and the praise she received was much deserved. Although she left her books and many of her personal possessions (including her salvaged Zeiss lens) to the Academy, among the most important of Eastwood's legacies was her protégé, John Thomas Howell.

IV. HOWELL AND ASSOCIATES (1950–1968)

John Thomas Howell⁸⁶ (1903–1994; Fig. 21) was born in Merced, California and became the first curator of botany at the Academy to be a “native” Californian. Upon graduation from grammar school, Howell was taken by an uncle on his first trip to the Sierra Nevada. He later noted, “A love for the out-of-doors and an interest in Nature that were engendered on that trip were destined to give direction to my whole life” (Howell 1967). Each summer between 1919 and 1925, he returned to the Sierra Nevada either on vacation trips or via working at Sierran resorts. He pursued botanical studies at the University of California under Jepson and received an M.A. degree in 1927 for his study of *Lessingia* (Asteraceae; Howell 1929). He helped pay for his undergraduate education by working on an hourly basis for Jepson; much of this work was of an editorial nature (Howell 1967). From 1927–1929, Howell was the first resident botanist at the Rancho Santa Ana Botanic Garden in southern California,⁸⁷ when the Garden was still located on Susanna Bixby Bryant's ranch in Santa Ana Canyon. Bryant fired Howell from this post, for which Jepson had recommended him, because she felt that he was “not suited for a position on the Rancho Santa Ana” (Smith

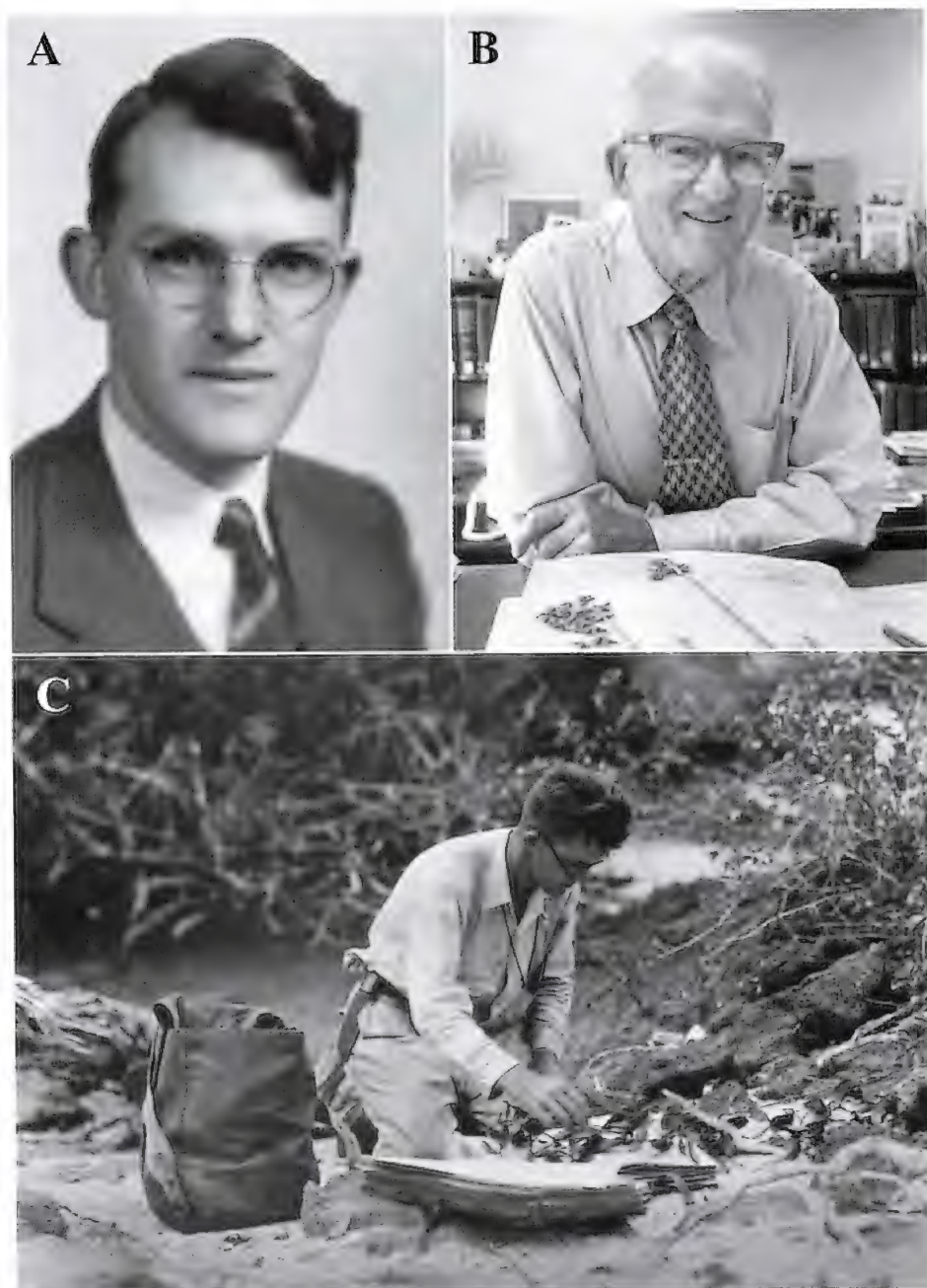


FIGURE 21. John Thomas Howell. A. Thirty-five year old assistant curator, just prior to his "Sierra Club decade" (1938 photo, CAS Special Collections). B. Eighty year old curator emeritus in his office in Golden Gate Park (1983 photo by S. Middleton, CAS Special Collections). C. Twenty-nine year old Howell collecting plants at Academy Bay on Santa Cruz Island during the 1932 Templeton Crocker Expedition the Galapagos Islands (1932 photo by T. Asaeda, Dept. Botany "biography files").

1989:12). Howell had come to know Eastwood during his visits to the Academy's herbarium in 1926 in order "to examine its rich historical collections of *Lessingia*" (unpublished typescript of 4 April 1975 by J.T. Howell, "Alice Eastwood and John Thomas Howell (mostly concerning Eastwood & Howell field work)," Howell Archives, C.A.S. Special Collections). Eastwood offered Howell a temporary position at the Academy in 1929 and a permanent one in 1930. Initially, she paid his entire salary from her own resources (Wilson 1955). He spent the next 65 years affiliated with the institution's Department of Botany.⁸⁸

Following Howell's dismissal from the Rancho Santa Ana and his taking up a temporary position at the Academy, relations with Jepson became strained. Although he returned to the graduate program in Berkeley for the 1929–1930 academic year, Howell never completed a Ph.D. directed by his undergraduate mentor as planned. With Jepson in control of the California Botanical Society and its journal *Madroño*, Howell felt it either awkward or impossible to publish there, so he suggested to Eastwood that they start their own journal. Thus, *Leaflets of Western Botany* was founded in 1932 (Fig. 29) with Eastwood supplying most of the funding and Howell taking on most of the editing.⁸⁹

In addition to their joint work on "*Leaflets*," Eastwood and Howell, often accompanied by others, collected widely in California and the western United States (Fig. 22). Together and separately, they conducted fieldwork through the Great Depression⁹⁰ and World War II. During the 1930s and 1940s, they usually personally paid the expenses of their field activities (Department of Botany archives, Box 1, CAS Special Collections.) On their joint field trips Howell did most of the collecting while Eastwood cataloged and pressed the specimens. It was, as Eastwood noted, "a grand partnership" (Bonta 1991:100). More than 10,000 "Eastwood and Howell" collections were made in Arizona, Colorado, Idaho, Nevada, New Mexico, Oregon, Utah, Washington, and in 48 counties of California during 1933–1941 (Howell 1967). By the end of his collecting days, Howell's collection numbers exceeded 54,000.⁹¹

From March to September of 1932, Howell was botanist on the Templeton Crocker Expedition to the Galapagos Islands where he collected 2,555 vascular plants on 13 of the islands (Fig. 21C).⁹² This is one of the largest and most important gatherings of plants by a single collector in the Galapagos Islands to date.⁹³ These collections formed the bases for some of the first serious revisionary studies of plant taxa with significant radiation in the Galapagos Islands. Howell's own publications on the Galapagos flora included work on Cactaceae, Amaranthaceae, *Mollugo*, *Tiquilia*, *Scaevola*, and *Polygala*. In spite of making such a rich and important tropical collection, Howell preferred to devote his efforts to studying the temperate flora of California and the western United States.

In 1939, Howell became a life member of the Sierra Club. Some years later he noted (Howell 1967:3) "For the next 10 years much of my botanical activity outside the Academy and most of my social life centered in programs connected with the Sierra Club. My natural history writings in the club "Bulletin," "Yodeler," "Nature Notes," and "Base Camp Botanics," aimed at popularizing systematic aspects of the natural sciences, particularly botany, were scarcely short of voluminous!" During this "Sierra Club decade" Howell participated in numerous Club outings for which he received plant-collecting privileges in exchange for providing natural history programs. "This cooperation, which continued through 1949, not only gave me an intimate knowledge of much of the high Sierra Nevada south of Yosemite but also gave the Academy a fine representation of alpine and subalpine Sierran plants" (Howell 1967:3).

With the retirement of Eastwood in 1949, Howell became curator (since 1930 his title had been "assistant curator") of the Department of Botany. In his first report on the activities of the Department in 1949, Howell reflected on Eastwood's tenure as curator: "It had been her experience to see

A



B



FIGURE 22. The "grand partnership:" Eastwood and Howell. A. On Mt. Rainier, Washington in 1937 (photo by E.H. English, Dept. Botany "biography files"). B. Collecting in Mohave Desert from Leucy I, a 1931 Ford touring car, during a trip with Y. Mexia to Utah and Arizona (1933 photo by Y. Mexia, Dept. Botany "biography files").

the foremost botanical collection in western America destroyed by fire in 1906 and her privilege to rebuild the outstanding herbarium and botanical library which the Academy now has" (Department of Botany archives, Box 1, C.A.S. Special Collections). Like Eastwood before him, Howell inherited both the curatorship of the herbarium and the running of the Botany Club. Following Eastwood's retirement, he continued collecting, editing "*Leaflets*," and publishing his studies of California's plants. Howell also served as botanical editor of *The Wasmann Journal of Biology* and the *Journal of the California Horticultural Society* for several years.

When Eastwood ceased active leadership of the Botany Club in 1952, Howell assumed that

role and skillfully directed the Club's activities and nurtured its members. In 1955, showing incredible foresight, Howell suggested to its members that the Botany Club establish an endowment fund for the benefit of the Academy's Department of Botany as an expression of appreciation for the institution's "sponsorship." At its meeting of 20 January in that year, Howell passed around a paper bag and received more than \$300 in donations. In a subsequent solicitation letter to the Club's members, Howell indicated, "The fund will not only be the aggregation of dollars and cents for helping with the Academy's botanical program but will become the tangible accumulation of assets of friendship and good will felt by many for the Academy, its Botany Department, and the California Botanical Club."⁹⁴ The efforts of Howell to establish a permanent fund for botanical projects was both timely and farsighted (see note 125 below). He had previously made personal investments to secure his own retirement, and managed many of his family's business interests (Howell 1967). As Howell anticipated, the fund continued to grow and earnings from it have been used for various projects over the years. Its market value in December 2003 was about \$782,000.

Growth of the herbarium beyond the limits of its space in the research wing of North American Hall is well documented in the annual reports of the Department of Botany (Department of Botany, Box 1, C.A.S. Special Collections; Fig. 23A). For example, in 1934 Eastwood noted, "The Herbarium now numbers 220,000 mounted sheets and probably 20,000 unmounted for which there is no room in the [96] cases. They have to be stacked in bundles on tops of the cases." With a touch of humor, she added, "However, the ceiling has not yet been reached." By 1936, in their joint departmental report, Eastwood and Howell were in no joking mood. The bundles were now nearly at the ceiling. Eastwood felt compelled to hire, at her own expense, Ms. H.P. Bracelin to arrange and label the bundled specimens into a scientific sequence so that the materials would be available. They noted that, "This additional work would not have been necessary if our facilities had been adequate. The need for herbarium cases is great." Ten new cases were finally installed in 1940, but this did little to relieve the congestion in the herbarium. As a result of both the space limitations and the wartime conditions, growth of the collection slowed significantly. By 1943, only about half of the 313,481 mounted specimens were in herbarium cases; the remainder was in bundles or boxes. In 1948 an insect infestation was discovered among the 900 boxes of specimens. Eastwood made a plea for help directly to the Board of Trustees; they appropriated funds for 50 additional herbarium cases. Following that success, things looked brighter in the early 1950s: exchange activities rebounded (10,747 specimens were distributed in 1951) and in 1951 the Department was allotted additional floor space in North American Hall that relieved the overcrowded conditions. By 1955, however, overcrowding was again becoming a problem and Howell's annual reports began making a new appeal for additional herbarium cases and floor space for the Department. His hopes and arguments were soon directed toward construction of a new building at the Academy. A plan to provide a new building to house the Department of Botany and its herbarium had been revealed by Academy director Robert Miller on Eastwood's 80th birthday in 1939 (Wilson 1955). The war years interfered with both the planning and fund-raising for this project, but Eastwood occasionally contributed to the building fund and encouraged her family and friends to do so as well. On the occasion of the Academy's centennial in 1953, the trustees renewed efforts to fund the building. With a substantial gift from the family of Norman B. Livermore, the Alice Eastwood Hall of Botany was completed in 1959 (Fig. 23B).⁹⁵ This facility, which also housed the Academy's new main library,⁹⁶ included public exhibition space and allowed for the rearrangement and expansion (into 108 new herbarium cases) of the collection, which was moved from its home (since 1916) in the research wing of North American Hall (Miller 1958, 1960). The new and spacious facilities for the Department of Botany on the ground and first floors of Eastwood Hall again afforded growth opportunities for the herbarium (Fig. 23C).⁹⁷

A



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C

FIGURE 23. Department of Botany facilities in Golden Gate Park (1915–1975). A. Howell and Minerva Hirst (Academy member) in cramped departmental quarters of research wing of North American Hall (1946 photo, CAS Special Collections). B. Exterior of Eastwood Hall of Botany building with the Department of Botany occupying the ground floor and part of the first floor; the subsequent home of the department, shown in Fig. 25, would be located in another new building to the left of Eastwood Hall (1959 photo from *Academy News Letter* 233, CAS Special Collections). C. Howell, Anita Nold-eke, and Javier Peñalosa in botanical quarters of Eastwood Hall of Botany (ca. 1967 photo by L. Ullberg, CAS Special Collections).

At the end Howell's tenure as curator, the number of vascular plant specimens in the herbarium had grown to more than 480,000 (Anonymous 1969), largely as a result of his own collections and those of the many professional and amateur botanists he influenced over the years. Howell had collected throughout California, but for some 25 years he devoted considerable time to collecting in the Sierra Nevada with the prospect of writing a flora of those mountains. Upon completion of *Marin Flora* in 1949, an account of the plants in the Sierra Nevada was projected for completion in five years (Howell 1967). Unfortunately, a flora of the portion of California that had been so important to Howell as a boy and as a young botanist was never completed. The 20 herbarium cases housing his Sierra Nevada collections⁹⁸ were incorporated into the general herbarium at the Academy during 1993–1996, after publication of *The Jepson Manual*; thus, they were not studied by many authors of treatments in that account of the state's flora (Hickman 1993).

Over the years Howell was mentor to a loyal following of amateur and professional botanists (in addition to those in the Botany Club), many of whom became associates in the Department of Botany (see Appendix II). Although the projected flora of the Sierra Nevada was not realized, numerous other local floras were completed either solely by Howell or by Howell in collaboration with his myriad associates. First, and paramount among these, was *Marin Flora, Manual of the Flowering Plants and Ferns of Marin County, California* (Howell 1949). This eloquent and popular guide was reprinted several times, revised into a second edition (with supplement) in 1970, and has undergone a major revision by Academy staff and associates. Important collaborative publications included: "Plants of the Toiyabe Mountains area, Nevada" (Linsdale et al. 1952), *A Flora of San Francisco, California* (Howell et al. 1958), *A Flora of Lassen Volcanic National Park, California* (Gillett et al. 1961), *The Vascular Plants of Monterey County, California* (Howitt and Howell 1964), "A Vegetation Survey of the Butterfly Botanical Area, California" (Knight et al. 1970), *Saint Hilary's Garden* (Howell and Ellman 1972), "A Catalogue of Vascular Plants on Peavine Mountain" (Williams et al. 1992), and *A Flora of Sonoma County: Manual of the Flowering Plants and Ferns of Sonoma County, California* (Best et al. 1996).⁹⁹ Those inspired and encouraged by Howell to produce local floristic studies include Peter Rubtsoff (1953), Ernest Twisselmann (1956, 1967), Henry Pollard (1959), Javier Peñalosa (1963), Gladys Smith (1973), Clare Wheeler (Smith and Wheeler 1992), and Gordon True (2003).

Howell published on diverse plant families (especially Asteraceae, Cyperaceae, Hydrophyllaceae, Poaceae, Polygonaceae, Rhamnaceae, and Rubiaceae) and his bibliography includes more than 500 entries. He considered his writings in and production of *Leaflets of Western Botany* to be his most important contribution to California botany. Following his retirement in 1968, the John Thomas Howell Chair in Western American Botany was established at the Academy in his honor.¹⁰⁰ By his wide-ranging botanical interests, generous nature, modest demeanor, and literary (to poetic) writing style, Howell had been the natural successor to Albert Kellogg. Passages from his *Marin Flora* (e.g., under *Eschscholzia californica* and *Brassica oleracea*) show a decided similarity in style to Kellogg's (1882) prose, which is evident throughout his "Forest Trees of California." Both botanists were equally enchanted by the state's flora.

As curator emeritus, Howell remained active in research on California plants until shortly before his death in 1994 at age 90. Like Eastwood, Howell lived a long and productive life, although much of it was in the shadow of his famous predecessor. When his time to lead the Department of Botany came, however, his dedication and productivity were equal to that of any previous curator at the Academy. The genera *Howelliella* Rothmaler (Scrophulariaceae) and *Johanneshowellia* Reveal (Polygonaceae) commemorate one of California's most prolific and generous botanists. Additional biographical information on Howell was provided by Thomas (1969), Daniel et al. (1994), Chickering (1989), and Smith (1989).

V. EXPANSIONS AND NEW DIRECTIONS (1968–2003)

The respective retirements of Eastwood and Howell each left a sizable gap in the botanical program at the Academy. Eastwood was succeeded by another energetic botanist, Elizabeth M. McClintock (1912–2004; Fig. 24A). McClintock was born in Los Angeles and spent her childhood in Arizona and southern California. She had an early interest in plants that led to a major in botany at the University of California, Los Angeles. McClintock received her Ph.D. in 1956 at the University of Michigan where she studied *Hydrangea* (Saxifragaceae) as a student of Rogers McVaugh. McClintock joined the Academy on 1 October 1948 when she was hired as a research assistant in the Department of Botany (with Eastwood paying her salary). Upon the retirement of Eastwood in January 1949, she became a curator of botany and maintained that position until her own retirement in 1977.

McClintock was the first curator of botany at the Academy to attain a Ph.D. Although her botanical interests were diverse, she was known primarily for her studies and collections of ornamental plants. Like Eastwood, she had a particular interest in the taxonomy of cultivated plants.¹⁰¹ She published numerous regional and local checklists of cultivated plants (e.g., Mathias and McClintock 1963; McClintock and Moore 1965; McClintock 1977; McClintock and Lieser 1979; McClintock et al. 1982) and was a major contributor (though largely unattributed as an author) to *Hortus Third* (Bailey Hortorium 1976). For 21 years, she was associate editor of *Pacific Horticulture* and contributed considerable text to that journal (Turner 1997).¹⁰² McClintock worked closely with the Strybing Arboretum¹⁰³ and in 1958 co-authored a list of plants cultivated there (Walther and McClintock 1958). With collaborators, she produced two floristic accounts of San Bruno Mountain, a park in San Mateo County, just south of San Francisco (McClintock et al. 1968, 1990). McClintock also was involved in local conservation efforts. Following in the footsteps of her predecessor, she was a vocal and effective opponent of a proposed plan to locate a freeway in part of Golden Gate Park, and for many years she was an outspoken critic of private efforts to develop habitat of the rare dune tansy (*Tanacetum camphoratum*) near San Francisco's Ocean Beach.¹⁰⁴

In 1977, McClintock did not desire to retire, but mandatory retirement at age 65 was in effect at the Academy at that time.¹⁰⁵ This, combined with having felt underappreciated at the Academy for studying ornamental plants, caused some resentment on her part. As a result, during the early years of her retirement, she spent much of her time working at the herbaria of the University of California in Berkeley. There, she wrote treatments of numerous families and genera for *The Jepson Manual*. With Thomas C. Fuller, an associate in the Academy's Department of Botany, she co-authored the important guide, *Poisonous Plants of California*, in 1986. Following the death in 1991 of her good friend Annetta Carter,¹⁰⁶ McClintock spent more time back at the Academy working on various horticultural projects. The most significant of these was *The Trees of Golden Gate Park and San Francisco* (McClintock 2001), an edited assemblage of her work on some of the trees grown locally. She maintained an office at the Academy from her retirement until 2000, when she was no longer able to work due to illness.

McClintock's collections are mostly from California (especially San Bruno Mountain and near Pixley in Tulare County) and from gardens. Her collections of ornamental plants built upon the Academy's already significant collection of cultivated plant specimens amassed by Eastwood and former director of the Strybing Arboretum, Eric Walther.¹⁰⁷ She also collected plants in Arizona (mostly the White Mountains and the western portion of the Grand Canyon). Autobiographical information on McClintock, based on interviews for an oral history, was published in *California Women in Botany* by the University of California's Bancroft Library (Regional Oral History Office 1987). Much of the animosity that she felt toward former Academy executive director, George

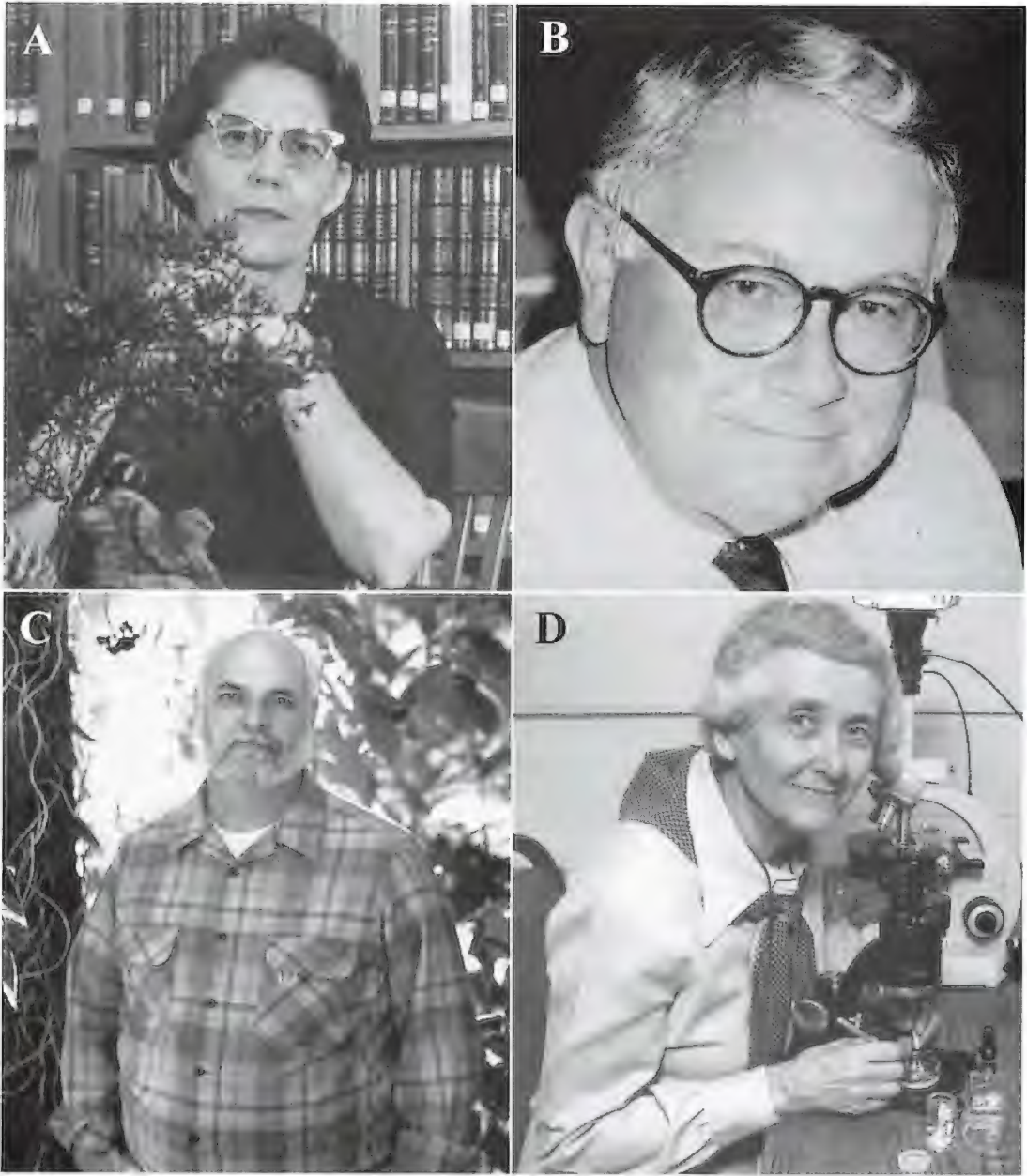


FIGURE 24. Academy curators of botany. A. Elizabeth McClintock (1961 photo, Dept. Botany "biography files"). B. John H. Thomas (undated photo, Dept. Botany "biography files"). C. Dennis Breedlove (1990 photo by S. Middleton, CAS Special Collections). D. Alva Day (1983 photo by S. Middleton, CAS Special Collections).

Lindsay, and her resultant contempt for the entire institution permeates her story.

With the retirement of Tom Howell in 1968, the Department of Botany, which had been rebuilt and fashioned by Eastwood and Howell, was poised for a major expansion of its resources, new research directions, and increased staffing. In the late 1960s, officials at Stanford University decided to eliminate their Division of Systematic Biology and dismantle their Natural History Museum.

An agreement was reached with the Academy to move Stanford's plant collections (i.e., the Dudley Herbarium or DS) to San Francisco and integrate them with the Academy's herbarium. In anticipation of this amalgamation, Stanford botanist John Thomas was appointed as a part-time curator of botany at the Academy in 1969, construction began on a new building (Wattis Hall) at the Academy's campus in Golden Gate Park in 1974 (Fig. 25A),¹⁰⁸ and compactorized storage units for housing the combined collections were funded by the National Science Foundation in 1974 (Fig. 25B–C).¹⁰⁹

Also in 1969, Dennis E. Breedlove (b. 1939; Fig. 24C) joined the Department of Botany as Howell's successor. Breedlove was born in Oakland, California, received an A.B. degree in 1962 from the University of California, Santa Barbara, and completed a Ph.D. in 1968 at Stanford University. His doctoral studies on *Fuchsia* (Onagraceae) were directed by Peter Raven.¹¹⁰ He came to the Academy from a position as research botanist at the University of California Botanical Garden in Berkeley. His studies of Mexican plants reinvigorated interest in tropical botany at the Academy and led to significant growth of the herbarium's collections. Breedlove collected primarily in California and Nevada (especially in the Sweetwater Mountains on the border between these states), Mexico (especially Chiapas, the Sierra Surutato in Sinaloa, and Baja California), and Guatemala. Throughout his career, Breedlove published on diverse plants (including taxa in the Actinidiaceae, Asteraceae, Ericaceae, Fabaceae, Gentianiaceae, Hypericaceae, Onagraceae, Scrophulariaceae, and Rubiaceae) in numerous botanical subdisciplines (including cytology, ecology, ethnobotany, evolution, and taxonomy).

Breedlove is best known for his collections and floristic studies in Chiapas,¹¹¹ the southernmost state of Mexico, and his ethnobotanical work in that state with various collaborators (Berlin, Breedlove and Raven 1974; Breedlove and Laughlin 1993). His activities in Chiapas were supported, in part, by the National Science Foundation (NSF); indeed, he was the first curator of botany at the Academy to receive direct NSF funding for his research.¹¹² Breedlove undertook many of his collecting trips to Chiapas accompanied by other Academy botanists (e.g., Almeda, Anderson, Bartholomew, Bourell, Daniel, Keller, McClintock), scientists from other herbaria (e.g., G. Davidse, R.L. Dressler, E. Palacios, P.H. Raven, A.R. Smith, J.L. Strother, R.F. Thorne), horticulturists (e.g., D. Mahoney, J. Sigg), and others (e.g., C. Burns, D. Axelrod, A. Ton). In the mid-1980s, while studying *Quercus* for a treatment of Fagaceae for the *Flora of Chiapas*, Breedlove developed an interest in this genus and collected specimens of it from many regions of Mexico. Although he amassed an enormous collection of Mexican oaks, knew the species well in the field, and had drawings prepared of several new taxa, he never published the results of his studies on the genus.

Following his retirement in 1994, Breedlove was appointed curator emeritus in the Department of Botany. In retirement, Breedlove devotes his time to pursuits other than systematic botany and is rarely seen or heard from. His primary (and a truly remarkable!) contribution to botany is undoubtedly the more than 72,000 collections that he made, mostly in Chiapas. He collected in Chiapas, often for extensive periods, every year between 1964 and 1992 (except for 1969 and 1990). These collections were made during a time when much of the original vegetation of that state was still intact. They document one of Mexico's most diverse floral assemblages and provide a legacy for future generations to study and admire. The first set of Breedlove's collections is deposited at the Academy (with the earlier-collected specimens in DS and the later-collected ones in CAS) and duplicates are widely distributed among herbaria. He personally maintains his field notebooks. *Breedlovea*, a genus of Chiapan mosses, was described by the eminent bryologist Howard Crum in his honor.

While retaining his faculty position at Stanford University, John H. Thomas (1928–1999;

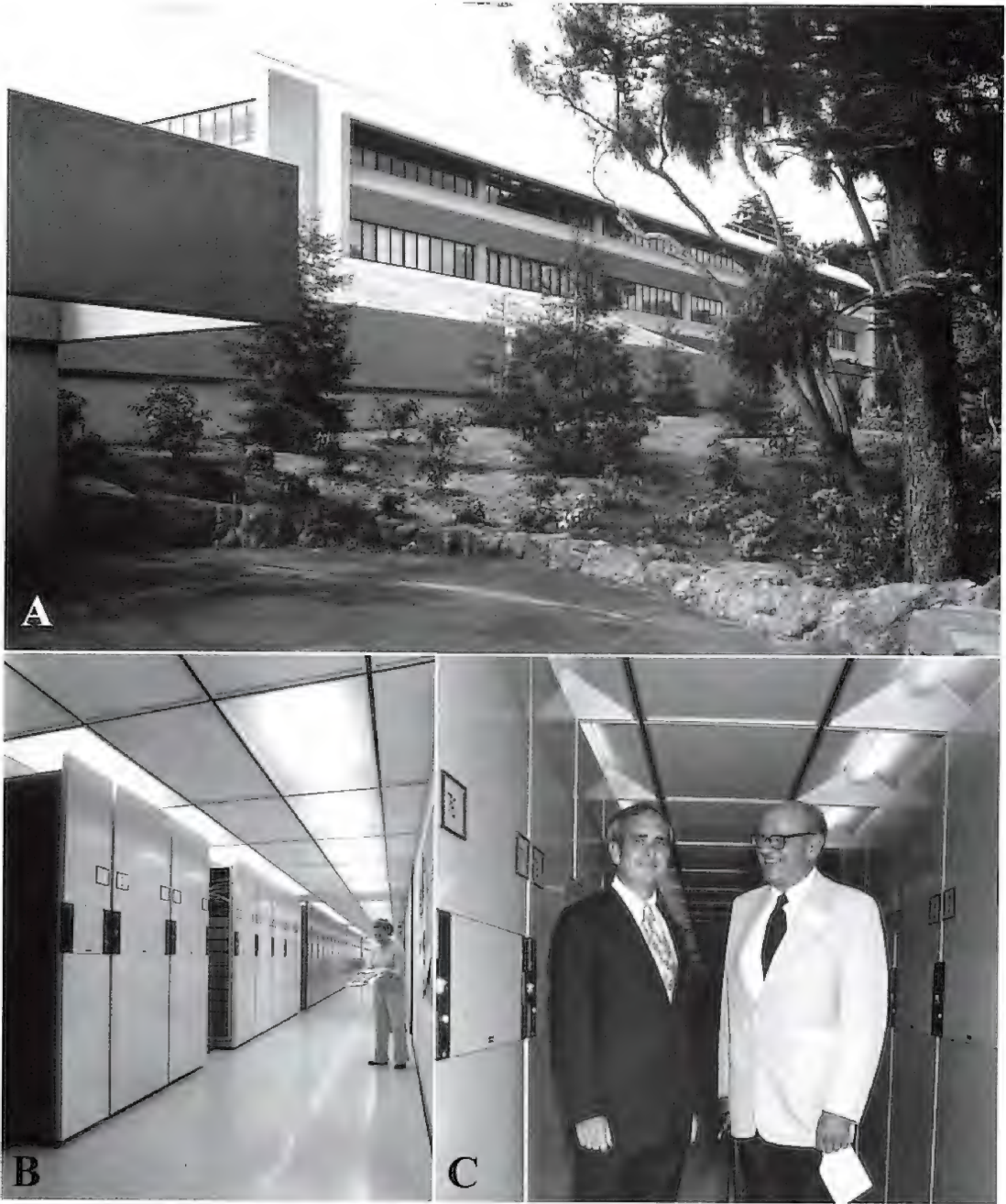


FIGURE 25. Department of Botany facilities in Golden Gate Park (1975–2003) A. Wattis Hall with the Department of Botany located on the third floor (1976 photo by L. Ullberg, CAS Special Collections). B. Compactorized storage of herbarium in Wattis Hall with E. McClintock (1976 photo by L. Ullberg, CAS Special Collections). C. Academy director George Lindsay (right) and departmental associate Peter Raven (left) during dedication ceremony of new botany quarters in Wattis Hall (1976 photo by L. Ullberg, CAS Special Collections).

Fig. 24B) spent one or more days a week at the Academy in his part-time curatorial position there. At Stanford, Thomas had been a doctoral student of Ira Wiggins,¹¹³ professor of biological sciences, and director of Stanford's Dudley Herbarium.¹¹⁴ His major botanical efforts include a floristic study of the Santa Cruz Mountains (based on his doctoral dissertation) that resulted in a popular and useful guide to the vascular plants along the coast of central California from Watsonville to San Francisco (Thomas 1961b) and, with Wiggins, a flora of the Alaskan Arctic slope (Wiggins and Thomas 1962). He was also interested in the history of botanical exploration in western North America and wrote an informative guide thereon (Thomas 1969).

Thomas began collecting plants in 1949 and made more than 20,000 collections from Alaska, Baja California (especially the Cape Region), California (especially the west-central portion of the state), and Montana (primarily the western portion of the state; Thomas in litt. 1981, Department of Botany "biography files"). His specimens are deposited in the Dudley Herbarium (DS) with duplicates dispersed to various herbaria (e.g., CAS and RSA). Shortly before his death, his personal herbarium at Stanford (to which reference was made in Thomas 1961a), consisting of several thousand duplicate specimens, was inspected and found to be so devastated by insect damage that it was discarded. His field notebooks remain at Stanford University.

To facilitate the integration of Stanford's Dudley Herbarium with that of the Academy, Alva G. Day (b. 1920; Fig. 24D), was hired at the Academy in 1975 as senior scientific assistant (subsequently assistant curator). Her position was initially funded by grants from the National Science Foundation. Day was born in Hollister, California and following training at the University of California, Davis and Oregon State College, received an A.B. degree in botany at the University of California, Berkeley. After stints as an herbarium botanist at UC-Berkeley and a research assistant in cytology at the Rancho Santa Ana Botanic Garden, Day completed her doctoral studies on *Gilia* (Polemoniaceae) at the Garden and received a Ph.D. from "Claremont University College" in 1964.¹¹⁵ She continued her research in cytogenetics and systematics at UC-Davis and UC-Santa Cruz prior to coming to the Academy in 1975. Transfer of the Dudley Herbarium to the Academy in 1976 was made possible, in part, by a five-year grant from the National Science Foundation. The task of integrating the two large herbaria continued for about 10 years with additional support from the National Science Foundation. When her NSF support ended in 1979, the Academy incorporated Day's position into the Department and she became an associate curator. As such, she continued the integration process and her systematic studies of Polemoniaceae until retiring in 1985. Following four years in the Washington, D.C. area, where she continued her studies at the Smithsonian Institution, Day returned to the Bay Area in 1989. She was made a research associate, and in 2002 she was appointed curator emeritus, in the Academy's Department of Botany where she actively studied Polemoniaceae (especially *Gilia*, *Allophyllum*, *Navarretia*, and *Loeselia*). Day's collections are primarily at either CAS or RSA, and her extant field notes and files are deposited at the Academy.¹¹⁶

With the amalgamation of the two herbaria, the Academy's collection of algae was transferred to the University of California, Berkeley, and most of the fungal collection was transferred to the United States Department of Agriculture in Beltsville, Maryland.¹¹⁷ Despite the lack of an institutional collection of algae, Sylvia Earle (b. 1935; Fig. 26A) was hired in the Department as a half-time curator of phycology in 1976. Earle is a prominent marine scientist with a doctorate (1966) from Duke University. Her interests include marine plants and animals, oceanography, and deep oceanic exploration. While at the Academy, her efforts were devoted primarily to lecturing and writing in conjunction with her interests in marine conservation. She collected algae but did not otherwise play an active role in the operations or activities of the Department of Botany. Her position became quarter-time and eventually honorary; it was discontinued by 1986. Algal collections

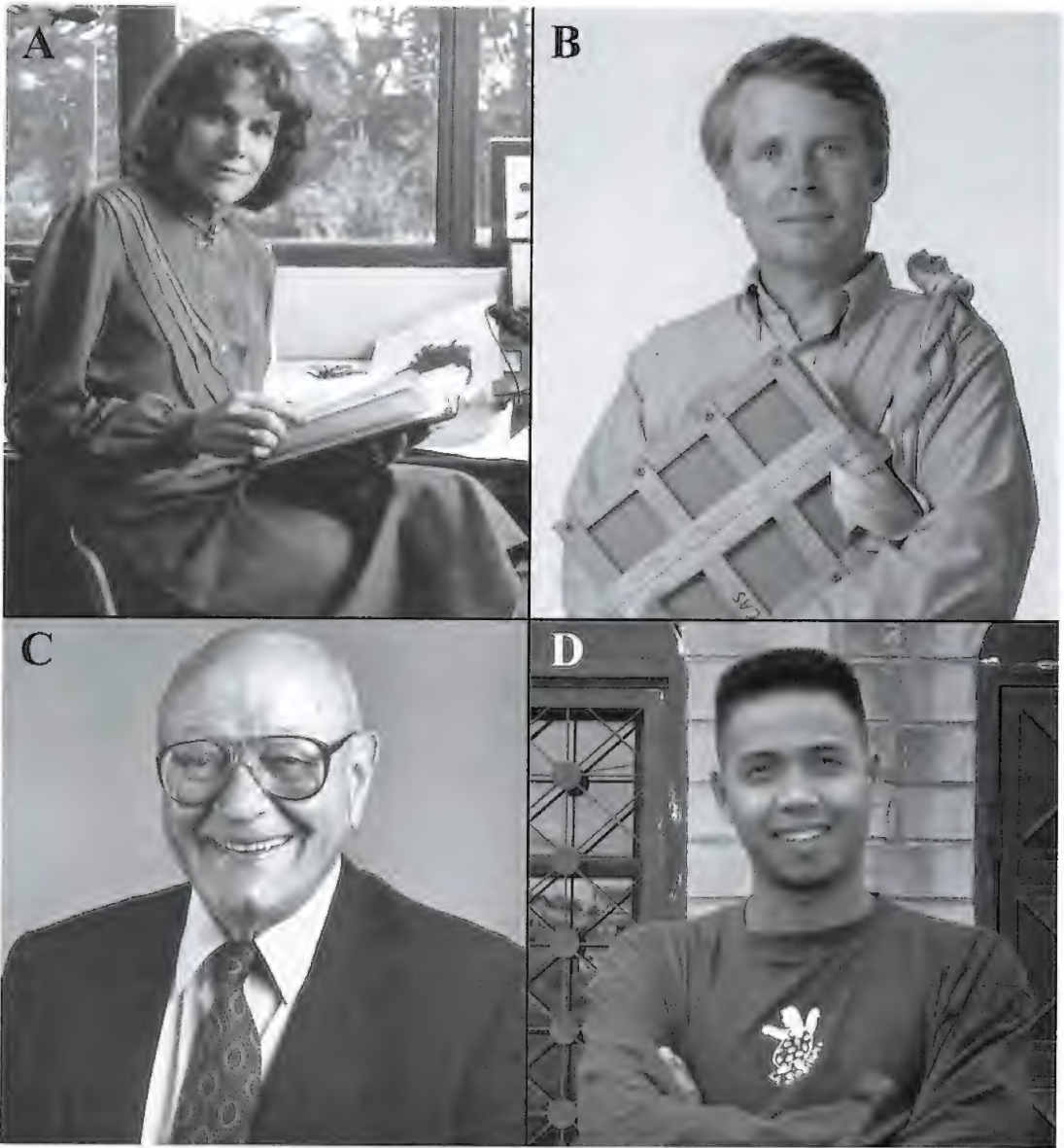


FIGURE 26. Academy botanists. A. Sylvia Earle (1983 photo by S. Middleton, CAS Special Collections). B. Bruce Bartholomew (1992 photo by C. Kopp, CAS Special Collections). C. George Lindsay (1994 photo by S. Middleton, CAS Special Collections). D. Heritiana Ranarivelo at Academy facility in Antananarivo, Madagascar (2003 photo by T. Daniel, Dept. Botany "biography files").

made during her tenure were eventually deposited at the herbarium of the University of California, Berkeley (P. Silva, pers. comm.).

In 1978, Frank Almeda Jr. (b. 1946; Fig. 27A) was hired by the Academy to fill the position vacated by McClintock. Almeda was born and grew up in Tampa where he learned many of the native and exotic plants of Florida. He received a B.A. from the University of South Florida in 1968. Immediately following receipt of a Ph.D. from Duke University in 1975, Almeda was appointed assistant professor in the Department of Biology at the University of California, Los

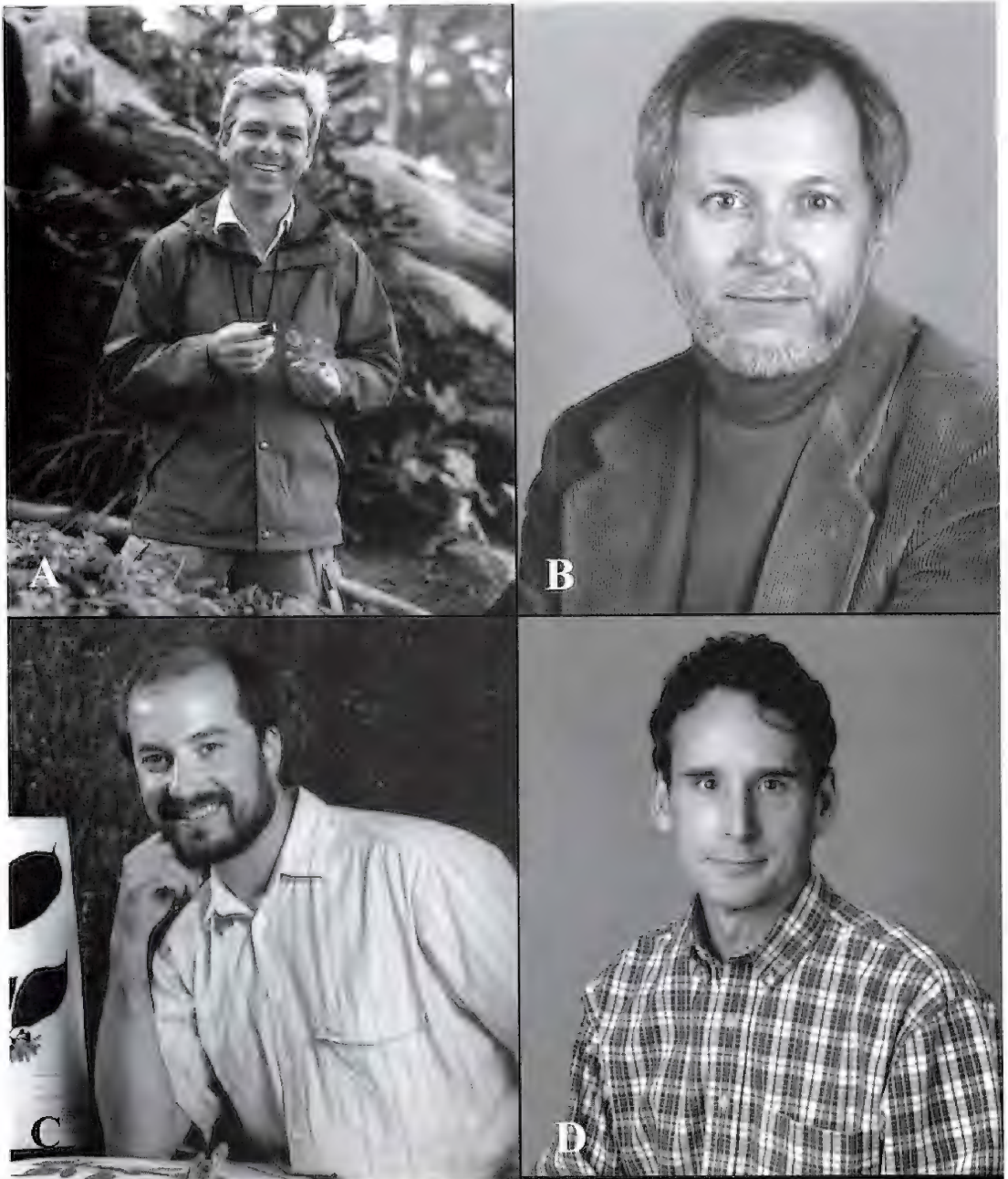


FIGURE 27. Curators of Botany in 2003. A. Frank Almeda (1992 photo by C. Kopp, CAS Special Collections). B. Thomas F. Daniel (1996 photo by D. Lin, CAS Special Collections). C. Peter W. Fritsch (1997 photo by D. Lin, CAS Special Collections). D. Kim E. Steiner (2000 photo by D. Lin, CAS Special Collections).

Angeles. There, in addition to his teaching duties, he was director of both the UCLA herbarium and the Mildred Mathias Botanical Garden. He brought a positive vigor to the botanical program at the Academy, collected with Breedlove in Mexico and Guatemala, undertook a revision of Howell's *Marin Flora*, and was instrumental in establishing departmental initiatives in Costa Rica and Madagascar. In 1981, Almeda was appointed to the first fully endowed curatorial position in the Department, the Decker and Martha McAllister Chair of Botany. Between 1983 and 1986, he served as the Academy's director of research. Although his knowledge of plants is extensive and global in scope, the subject of Almeda's dissertation and most of his subsequent publications has been the family Melastomataceae. His diverse studies of this large, mostly tropical family have been concentrated in Mexico, Central America, Brazil, and Madagascar.

By 1980, it was recognized that professional staffing in collections management was needed for operating the large and growing plant collection and to allow the curatorial staff sufficient time to concentrate on research.¹¹⁸ In 1982, Bruce Bartholomew (b. 1946; Fig. 26B) was hired to fill the newly created position of collections manager in the Department.¹¹⁹ Bartholomew was born in Boston, Massachusetts, grew up in southern California, and received a Ph.D. from Stanford in 1972. Prior to coming to the Academy, he had been employed as a botanist at the University of California Botanical Garden in Berkeley since 1973. Many of his publications deal with the Theaceae (especially *Camellia*). He initiated a collecting program in California's botanically least-known county (Modoc County) in 1988, and is preparing an account of the plants there. His interests in Chinese botany have resulted in numerous collecting trips to China, establishment of relationships with several Chinese herbaria, a position on the editorial committee of the *Flora of China*, and significant growth of the Asiatic collections in the herbarium.

In 1986, Thomas F. Daniel (b. 1954; Fig. 27B) joined the Department of Botany, filling the position previously occupied by Day. Daniel was born in Durham, North Carolina, and studied botany at Duke University, from which he received an A.B. in 1975. He received a Ph.D. from the University of Michigan in 1980 and, following a semester as lecturer at Michigan, took up a position as curator of the herbarium at Arizona State University in 1981. At Arizona State, his duties consisted of research and curation. There he continued studies of New World Acanthaceae that had been the subject of his doctoral research, and began several floristic projects in Arizona.¹²⁰ After coming to the Academy, Daniel expanded his interest in Acanthaceae to the Paleotropics, began a floristic account of the plants of San Francisco County based on Howell et al.'s *A Flora of San Francisco, California*, and took over editing of *Flora of Chiapas* (which had been begun by Breedlove). Daniel served as editor of scientific publications at the Academy from 1991 to 1994. His collections are primarily from Arizona, California, Mexico, Central America, Bolivia, and Madagascar with first sets at MICH, ASU, and CAS.

In 1996, Peter W. Fritsch (Fig. 27C) was hired to fill the position vacated by Breedlove. Fritsch was born in Milwaukee, Wisconsin in 1961, received both B.S and M.S. degrees at the University of Michigan, and in 1995 was awarded a Ph.D. from Claremont Graduate School for his studies on *Styrax* (Styracaceae) at the Rancho Santa Ana Botanic Garden. He was a Mellon Postdoctoral Fellow in Botany at Duke University prior to coming to the Academy. His studies of phylogeny and biogeography in *Styrax* and other woody genera involve the use of molecular data; indeed, Fritsch was the first botanist hired at the Academy with a background in the techniques of molecular systematics. At the Academy, he has spearheaded the interdisciplinary biotic survey of the Gaoligongshan biodiversity hotspot in western Yunnan, China. His collections are largely from Michigan, the West Indies, Mexico, Madagascar, and China.

Although he was never a member of the Department of Botany's staff, botanist George E. Lindsay (1916–2002; Fig. 26C) was in important figure in overseeing growth of the Academy, in

shaping the staffing and facilities of its research departments, and publishing the results of his research on cacti. Lindsay was born in Pomona, California and worked for a period as a citrus farmer on a lemon farm he had inherited. He received both his undergraduate and graduate degrees at Stanford University. His doctoral work on *Ferocactus* (Cactaceae) under Ira Wiggins was eventually published (Lindsay 1996) by his friends and admirers.¹²¹ As executive director of the Academy from 1963 until 1982, and thereafter as director emeritus, Lindsay pursued his interests in systematics of *Ferocactus*, development of the Academy's nature preserve (Pepperwood) in Sonoma County, and natural history/conservation in the peninsula of Baja California and the Galapagos Islands. He maintained an office in the Department of Botany from his retirement as executive director until a few years prior to his death. In 1998, the Lakeside Foundation established an endowed chair in the Department of Botany in honor of George and Geraldine Lindsay.

The creation of this new position in the Department led to the hiring of Kim E. Steiner (b. 1953; Fig. 27D) in 2000 as the first George and Geraldine Lindsay Chair of Botany. Steiner was born in Ann Arbor, Michigan, received an A.B. degree from Indiana University, and was awarded both M.S. and Ph.D. degrees from the University of California, Davis. Following his doctoral studies on pollination of Neotropical Euphorbiaceae, Steiner was a scientist with the National Botanical Institute of South Africa and was stationed at the Compton Herbarium in the Kirstenbosch Botanical Garden. There, he pursued his interests in pollination biology and systematics of Scrophulariaceae and Orchidaceae in the rich flora of the Cape Region. His research, combining information on breeding systems with molecular phylogenetics, added another dimension to the subdisciplines represented in the Department. Most of his collections are from southern Africa, Andean South America, Panama, and Mexico.

Several significant events or activities in recent years have also contributed to expanding the influence, outreach, and reputation of the Department of Botany. In 1982, the Tilton Postdoctoral Fellowship in systematics was established at the Academy.¹²² The first recipient of this year-long fellowship was botanist Leslie R. Landrum who studied Myrtaceae in the Department during 1983–1984. In 1995–1996, Panamanian botanist Ivan Valdespino held the Tilton Fellowship. He studied *Selaginella* during his tenure at the Academy.

In 1998, Academy curators were invited to become research professors in the Department of Biology at San Francisco State University. This permitted curators to chair graduate student committees at SFSU and to have their graduate students work at the Academy. The first graduate student in the Department of Botany participating in this joint Academy-SFSU program was Geoff Smick, who began his studies in 2000.¹²³ Numerous undergraduate students have worked with the current curators in the Department of Botany, either under the auspices of the Academy's Summer Systematics Institute, the Academy Fellows Illustration Internship, Wallace Internship, the Cooley Internship, or independently.¹²⁴

Using some of the earnings on the Department's endowed funds,¹²⁵ Academy botanists decided in 2001 to employ a plant collector in Madagascar. With assistance from the Missouri Botanical Garden, a young Malagasy botanist was identified, brought to San Francisco for discussions, and hired in 2002. Heritiana Ranarivelo (b. 1975; Fig. 26D) is stationed at the Academy's research facility in the Malagasy capital, Antananarivo. He received a Diplôme d'Etude Approfondie in plant biology and ecology from the University of Antananarivo in 1999. As the Department's botanical coordinator for projects in Madagascar, he collects, processes, and identifies plants; works closely with various governmental agencies and private organizations that seek to promulgate and preserve the Malagasy flora; assists Academy botanical expeditions to Madagascar; and collaborates with Academy scientists on their research in the country.

During the 1980s and 1990s curation of and studies on the remaining cryptogamic collections

at the Academy (bryophytes and lichens) were reinvigorated. These efforts were overseen by senior curatorial assistant Mona Bourell (b. 1952), who had studied bryophytes at San Francisco State University. She actively curated, added to, and promoted use of the bryological collection. In 1996, Department associate James Shevock shifted his research focus from vascular plants to bryophytes and began adding to that collection as well.¹²⁶ Volunteers from the California Lichen Society were active for a period in the 1990s working with the lichen collection.

As of 2003, the Academy's Department of Botany consisted of 12 Academy-funded staff members (4 curators, 1 collections manager, 1 botanical coordinator in Madagascar, 5 curatorial assistants, and a secretary/receptionist).¹²⁷ Others working in the Department at that time included Orbelia Robinson, editorial assistant for the Flora of China Project (funded through the Missouri Botanical Garden), and Lihua Zhou, botanical project manager for the Academy's biotic survey in western Yunnan, China (funded by the National Science Foundation). In addition to salaried staff, the Department has benefited greatly by a dedicated corps of volunteers from the local community.¹²⁸ Current volunteers assist in numerous departmental activities including: specimen preparation, library work, label preparation, plant identification, and assistance with research projects.

Also as of 2003, the Department's herbarium (comprising both CAS and DS) contained 1,824,000 total specimens with an average annual accession rate since 1990 of about 20,000 specimens.¹²⁹ The vascular plant collection is worldwide in scope with 1,771,500 specimens including 10,555 types. The collection includes approximately 50,000 pteridophytes, approximately 15,000 gymnosperms, and approximately 1,706,500 flowering plants. The bryophyte collection numbers about 39,500 specimens and is worldwide in scope. The lichen collection contains about 13,000 specimens and is also worldwide in scope.¹³⁰ Databasing of the entire collection of plants from Chiapas, Mexico (which numbers more than 56,000, and upon which the *Flora of Chiapas* is largely based) has been completed. Databases of both the Chiapas and type collections are available electronically on the Department's web page at: <http://www.calacademy.org/research/botany/>. Other databases and information about the Department are also available at that URL. The Lillian Devendorf Hohfeld Botany Library¹³¹ houses approximately 560 botanical periodicals (i.e., entire journal runs or portions thereof), more than 13,700 botanical books/monographs (not individual titles, but non-journal barcoded items), and three reprint collections.¹³²

VI. IMPLICATIONS, IMPACTS, AND FUTURE DIRECTIONS

Amateurs in Botany

In relating the major historical events concerning botany and botanists associated with the California Academy of Sciences during its first 150 years several themes and threads are evident and worthy of some discussion. Prominent among these is the role of amateurs in plant sciences at the institution. Much of the history of botanists at the Academy is dominated by interested and capable amateurs (i.e., those pursuing botany as an avocation, often without benefit of extensive formal schooling in the science). Like many early botanists affiliated with the Academy, Kellogg and Curran/K. Brandegee were both medical doctors;¹³³ Greene was a minister; and Eastwood (whose highest educational degree was a high school diploma) had been a schoolteacher. Howell was the first professional botanist hired at the institution, and McClintock (who became a curator in 1949) was the first Academy botanist to earn a Ph.D.

The proactive encouragement of amateurs in the botanical work of the Academy was raised to a new level with the establishment of the California Botanical Club in 1891. Under the successive leadership of Brandegee, Eastwood, and Howell, its members assisted in or conducted botanical

research and they provided technical labor, funds, and collections to augment the operations of the Academy's often underfunded Department of Botany. Eastwood, Howell, and McClintock all helped to bring botany to a general audience by publishing popular articles in a variety of outlets. It is perhaps revealing of Howell's nature that he, the first professionally trained botanist hired by the institution, probably did more to encourage and train avocational botanists than any other Academy scientist. Results of his efforts are manifest by the local floristic treatments noted above.

Female Curators and Gender Discrimination

Much has been made of Kellogg's resolution of 1853 to admit females into all aspects of Academy life. The fact that the hiring of female curators there began in the 1880s is particularly remarkable. In spite of its early declaration and subsequent actions in hiring women, was gender discrimination present at the Academy? Undoubtedly it was to some degree, just as it was widespread in public and private organizations in the United States prior to legislation and litigation that made discrimination based on gender unlawful. Kellogg was always referred to as "Dr. Kellogg" by Hittell (1997) whereas Katharine Curran Brandegee (also an M.D.) was always referred to as either "Mrs. Brandegee" or "Mrs. Curran". However, this is also how she was referred to in *Zoe*, a journal over which she exercised considerable influence. Several men served with her as "co-curators" before she became the sole curator of botany. Following Brandegee's departure, Eastwood also was a "co-curator" with various men for a number of years. Upon Howell's retirement, McClintock was made "acting chairman" for several years before she was accorded the title of "chairman." One can only guess as to the extent these "perceived slights" actually represented gender discrimination. Compared with many other academic institutions, however, the Academy's record on employment opportunities for women can only be regarded as enlightened. Indeed, that record is a monumental testament to the men who hired and worked with these early female curators, to the female curators who unfailingly proved their abilities time and time again, and to the institution that conducted this "experiment in equality" in the nineteenth century. It is to be hoped that in the coming years, the institution will carry this experiment even further with the proactive training and hiring of other underrepresented minorities in the natural sciences.

Responses of female curators of botany at the Academy to gender discrimination, real and/or perceived, is of interest. Bonta (1991) portrayed K. Brandegee, undoubtedly with ample justification, as a woman who was much maligned in her profession because of her gender, and who was rather self-deprecating and defensive (if not bitter) about her professional status. McClintock exhibited a similar attitude based on both her gender and chosen field of study, horticultural taxonomy (see Regional Oral History Office 1987). Brandegee's professional successes at the Academy likely helped to make Eastwood's pursuing a career in botany there less difficult. But the divergent personalities of these two strong-willed individuals probably contributed more to their respective successes and failures than did discrimination by the male-dominated scientific establishment. In spite of her meager formal education, Eastwood was outwardly self-confident, optimistic, and determined to accomplish her goals irrespective of any obstacles. Given the ordeals that she experienced as a child, and the privations and dangers she faced while collecting plants in the Colorado Rockies as a young woman, the opportunity to work in and contribute to her beloved profession of systematic botany was surely the joy of which she so often spoke. It was unlikely that she would be prevented from her tasks by anyone—male or female. It was indeed fortunate for both the discipline of botany and for the Academy that she was a curator during and following the Great San Francisco Earthquake and Fire.

Destruction and Opportunity

Undoubtedly, the most significant event of the first 150 years of the Academy's history was the destruction of its buildings, collections, and records by the earthquake and fire of 1906. The loss of almost all botanical collections, manuscripts, and library materials was a tremendous setback, not only for the institution, but for plant science in California as well. Yet that event also provided a turning point for the development of botanical resources at the Academy. Indeed, the deleterious effects were partially ameliorated by subsequent actions taken—some inherent in how botany functions as a discipline and others both heroic and fortuitous. Key among these was Eastwood's rescue of the types that she had segregated from the Academy's herbarium. These not only provided some important collections from the otherwise destroyed herbarium and a focus for rebuilding the botanical collections at the institution, but those 1,497 specimens provided both a physical and a symbolic icon around which the Department (and the institution) could rally for years to come. The destruction itself sparked fieldwork by Eastwood (and later Howell) who sought to replace much of what had been lost through extensive collecting in California and elsewhere in the western United States. The abundant exchange materials (both plants and published literature) that had been sent around the world by Kellogg, Curran/Brandege, and Eastwood prior to the destruction had helped to disperse California's botanical resources and to draw attention to the small institution on the Pacific Coast of North America. Many recipients of these exchanges then provided donations of literature and specimens to help rebuild the Academy.¹³⁴ Through Eastwood's personal efforts, generous gifts of specimens and library materials, and selective purchases of important botanical specimens, the Department of Botany reestablished itself as a place of scientific prominence within a few decades of its 1916 reopening in Golden Gate Park.

Coincident with the rebuilding of botanical resources at the Academy came the beginning of a shift in focus in those resources. Although the Academy had accessioned plant collections from all parts of the world prior to 1906, it was primarily a provincial collection with a focus on the temperate flora of California and the western United States. By 1906 other herbaria concentrating on California's rich plant life were operating in the San Francisco Bay Area and were available to the botanical community (i.e., at the University of California in Berkeley and at Stanford University in Palo Alto). Following the destruction of the largest collection of plants from California, Eastwood sought to establish a worldwide collection in its place. Such a shift in focus is likely typical for many growing herbaria when they attain a sufficiency of resources involving collections, library materials, and staff. Eastwood sought to augment the focus of the collection in the absence of such resources, however. Two events helped her to achieve this goal very quickly. The first was Alban Stewarts's (Fig. 20) vast plant collection from the Academy's 1905–1906 expedition to the Galapagos Islands. These arrived in San Francisco following the earthquake and fire and would become a unique tropical resource at the institution. Purchase of the large Prager herbarium in 1920, with specimens from many parts of the world, also exemplified this shift to an internationally focused collection at the Academy. These acquisitions were subsequently augmented by Howell's extensive collections from the Galapagos Islands and other localities in the eastern Pacific region during the Academy's Templeton-Crocker expedition, and by Lewis Rose's personally funded, worldwide exchange program on behalf of the Department of Botany. The shift to a worldwide herbarium culminated with the hiring of Breedlove in 1969. Combining Breedlove's interests in the flora of southern Mexico, his prodigious collecting abilities,¹³⁵ and the diverse collection established by his predecessors, an environment ripe for the study of tropical plants had been created at the institution. Given the research priorities in systematic botany and available extra-mural funding at that time (e.g., Buechner and Fosberg 1967; Sohmer 1980; Raven 1988) this was a fortuitous circum-

stance. The Department's commitment to enhance botanical knowledge of the entire planet (especially tropical regions) has been reflected in all subsequent curatorial hires since that of Breedlove. With this increased international perspective, the Department of Botany has continued to address local and regional botanical needs. The production or revision of local floras has continued without interruption in the Department since Howell's retirement. Indeed, the Academy now seeks to provide new insights into the taxonomy of western American plants by supporting a position dedicated to Californian and western North American botany via the endowed Howell Chair. The Academy's herbarium once again houses the largest collection of California's vascular plants; and now these plants can be studied at the institution in the context of the entire planet's flora. Eastwood had the foresight, set the stage, and provided the initial resources; it is little wonder that her vision has been realized.

In spite of all that has been achieved since the destruction of 1906, it is important to note that rebuilding the botanical resources at the Academy has been a lengthy process. Where possible, reacquisition of duplicates of the lost treasures, with respect to both plant collections and botanical literature, continues to the present day. For example, in 1960 Academy director Miller (1960) noted that the Department had reacquired a set of C.G. Pringle's Mexican collections.¹³⁶ A previous set of Pringle's important collections had been destroyed at the Academy in 1906 and many of the species they encompassed had not been represented in the collection since that time. The largest reacquisition of early California plant specimens, including many that had been represented at the Academy in 1906, came about with the incorporation of Stanford's Dudley Herbarium into that of the Academy. Because the Academy had exchanged specimens with Stanford University, some specimens collected by Academy botanists (including Kellogg and Bolander), that were destroyed at CAS in 1906 are now represented at the institution by duplicate specimens that are part of the Dudley Herbarium. These bear the "DS" rather than "CAS" accession.¹³⁷

Importance of Early Curators

Founders of the Academy were described by Jepson (1897) as men who devoted themselves to the institution's "scientific upbuilding" with a manifest "single-heartedness." The early history of botany at the Academy also reflects this type of devotion among the individuals elected or hired to curatorships at the institution. Whether mild-mannered (e.g., Kellogg) or strong-willed (e.g., Curran/K. Brandegee), they were generous "workaholics" who often put the Department's interests and welfare above their own. Their lives were devoted primarily to their studies and to the Academy. Indeed, until the 1960s most of the long-term curators of botany at the Academy (except Brandegee) remained unmarried.¹³⁸

It is undoubtedly revealing of the early Academy that those who were to become its most famous botanists consisted of a failed mid-nineteenth century physician/pharmacist who believed in equal employment opportunities for women, an unsuccessful female physician who was apparently the first woman hired in a senior curatorial position at a major museum, an aspiring science writer and self-taught botanist whose highest educational degree was a high school diploma, and a recently-fired professional botanist with a Master's degree. Each of them, Kellogg, Curran/K. Brandegee, Eastwood, and Howell, became prominent and respected botanists whose impact and influence continue to the present day. They brought honor, respectability, and fame to the California Academy of Sciences, and they established high standards and visionary goals to which their successors have aspired. The words applied to Kellogg by his good friend George Davidson (1889:vi) are indicative of this type of person, and would appear to be equally applicable to most of his well-known successors: "He had a cheering word for every effort, he assisted each young

aspirant, he gave his time lavishly to investigation and to that diffusion of knowledge which is for the betterment of the people." They created an atmosphere that was inclusive and conducive to productive botanical research. The spirit present in the little gallery of the church building that harbored the Pacific Coast's leading botanical center for much of the last quarter of the nineteenth century was well remembered by S.B. Parish¹³⁹ many years later when he reflected upon "the kindly generous spirit which they show to visitors, throwing open their herbarium and their library and assisting them in every way that they can..." (Anonymous 1922:73).

The generosity and hospitality of the early curators has been a recurrent theme throughout the history of the Academy's botanical program. In spite of differences in personality and belief, botanists at the Academy generally have gotten along well with one another and provided an atmosphere conducive to their work as well as to that of the amateurs and professionals that sought their assistance. This was particularly evident during the tenures of Eastwood and Howell. Indeed, it is worth relating the stories of three significant workers in the Department of Botany who were welcomed and nurtured at different stages of their lives by both curators.

Lewis S. Rose (1893–1973, née L.S. Rosenbaum; Fig. 28A–B) was a native San Franciscan whose initial association with the Department of Botany at the Academy dates from 1915 when he began accompanying the Botany Club on field trips with Eastwood. He received an undergraduate degree in botany at the University of California, Berkeley in 1917. After service in World War I, he worked in the investments field and became financially independent. In 1930 Rose volunteered his botanical talents to the Academy's herbarium; he subsequently became both an Academy fellow and a research associate in the Department of Botany. Rose worked four days a week in the Department as a volunteer for more than 30 years. He was responsible for much curatorial work including filing specimens in the herbarium, collecting plants, preparing exchanges, and maintaining bibliographic files. At his own expense, Rose collected plants (mostly in California and often with the Botany Club) that he exchanged with foreign and domestic herbaria. During the next 30+ years, Rose's exchange activities resulted in the receipt of between 70,000 and 100,000 specimens, all of which were donated to the Academy. Rose's personal collections resulted in the discovery of several new species (at least 10 of which bear his name), and his exchange materials have enriched the Academy's herbarium with plants from around the world. Following his death, his widow, Elise, created the Lewis S. Rose Memorial Fund in the Department of Botany. After her death, the couple's son, John J. Rose continued to add to this fund, which became the Lewis and Elise Rose Memorial Fund.¹⁴⁰ In 2000, John Rose established the John J. Rose Postdoctoral Fellowship in Botany at the Academy with a sizeable donation.

Following his retirement from the United States Department of Agriculture in 1944, Dr. Thomas H. Kearney (1874–1956; Fig. 28C) came to San Francisco where his two sisters had settled. Kearney was born in Cincinnati, Ohio and was educated at the University of Tennessee and Columbia University. He had been a botanist with the Department of Agriculture since 1894 and retired from the Bureau of Plant Industry where he was principal plant physiologist. He was an expert on cotton breeding and conducted many of his studies in Arizona. While there, he became interested in the state's native plants, which he collected in his spare time. This avocational interest resulted in the publication in 1942 of *Flowering Plants and Ferns of Arizona*, co-authored with his colleague Robert H. Peebles (Kearney and Peebles 1942). Once in San Francisco, the distinguished cotton breeder and expert on Arizona's flora was invited by Eastwood to continue his work at the Academy. Kearney was given the title of research associate in the Department of Botany and subsequently was named an honorary curator. At the Academy, Kearney (in collaboration with Peebles) prepared a revised and expanded account of Arizona's plant life, *Arizona Flora* (Kearney et al. 1951) and continued publishing his taxonomic studies on the cotton family (Malvaceae). In



FIGURE 28. Departmental associates. A. Lewis S. Rose collecting in Ben Lomond sandhills, Santa Cruz Co., California (1962 photo by J.T. Howell, Dept. Botany "biography files"). B. Rose in herbarium (1962 photo, CAS Special Collections). C. Thomas H. Kearney using Eastwood's lens in herbarium (ca. 1952 photo, Dept. Botany "biography files;" used in *Pacific Discovery* 5(2):529. 1952). D. Peter Raven and Student Section instructor Joan Taylor (ca. 1950 photo, CAS Special Collections).

posthumous reminiscences, Kearney (1958:280) noted that he had accepted Eastwood's invitation to make his headquarters at the Academy "with alacrity and have never regretted doing so. I have found working conditions there very satisfactory and the personal associations most congenial." Kearney's friendship and contributions were also much appreciated by his Academy colleagues: Wiggins (1952) published a biography of him in the institution's magazine, and Howell's *Leaflets of Western Botany* volume 8(12) consisted of a tribute to him.

Nine year old Peter H. Raven (b. 1936; Fig. 28D) first visited the Academy's Student Section (subsequently Junior Academy) in 1945. Although he was initially primarily interested in collecting and identifying insects, Raven had general interests in natural history. "My first contact with the Botany Department came while on a Student Section tour of the departments. In botany I found that marvelous lady who had been associated with the Academy for so many years, the late Miss Alice Eastwood. When I first met her in 1946, she was near her ninetieth birthday, but she had lost none of her love for plants or helpfulness to those who studied them. I can remember Miss Eastwood looking through a small collection of plants I had made in the Santa Cruz Mountains, stopping here and there while naming them to give me a word of encouragement. I recall her saying as

she examined a collection of a small wood-rose, for example, 'How happy I am that you collected it with fruit. Now it is really quite simple to identify it — see, it has no hips.' Thus was Miss Eastwood able to teach picking the positive instead of negative aspects of any situation. One can imagine the effect of a compliment from Miss Eastwood to a young student" (Raven 1956:3). This encounter prompted Raven to collect more plants during the next few years and to bring them to the Department of Botany. "I well remember that a strange plant of the sunflower family which grows along streams in the hills (*Petasites palmatus*), was the first specimen that I was privileged to bring to the Botany Department myself. Here Mr. Howell, another master at the art of imparting his enthusiasm to all ages and types of students, told me what the plant was and a little about it" (Raven 1956:5). Between 1949 and 1956, Raven was employed part-time by the Department of Botany. Some of his work consisted of collecting plants for an account of the flora of San Francisco County, on which project he served as a co-author (Howell et al. 1958). Among his extensive and well-prepared collections from San Francisco were a new *Arctostaphylos* (*A. hookeri* subsp. *ravenii*) and a new *Clarkia* (*C. franciscana*).¹⁴¹

Raven's association with the Academy and its Department of Botany helped to determine his well-known career path in systematic botany, natural history, and conservation (Raven 1956; Carlquist 1997). Raven is a fellow of the Academy and an associate in the Department of Botany. Since 1971, he has been director of the Missouri Botanical Garden in St. Louis.

Kellogg's generosity and collegiality had attracted both interested individuals and much-needed collections to the young Academy. Katharine Brandegee's sponsorship of the California Botanical Club with its corps of willing apprentices, plant collectors, and herbarium volunteers continued the tradition. The nurturing of Rose, Kearney, and Raven by Eastwood and Howell, and the kindnesses shown to them while at the Academy, were repaid many times over by the collections, prestige, and friendship these three individuals, and many others like them, brought to the institution. In conjunction with the public exhibits in the Academy's natural history museum, the informal and personalized botanical instruction by the curators was primarily responsible for building a local botanical community and following.

Evolution of "Curator" and Changing Trends in Research

The Academy's founders had three basic objectives: development of the natural sciences largely through investigation of California's natural and cultural resources, assemblage and maintenance of museum collections, and establishment of a scientific library (Miller 1960). The role of carrying out this mission was and generally remains the responsibility of Academy curators. While the primary duties of botanical curators have remained stable throughout the institution's history (e.g., collecting specimens in the field, overseeing the herbarium, conducting original research, and determining most acquisitions for the library) the position of "curator" has undergone considerable evolution.

Early curators were elected annually and were not paid for their services to the institution. The title sometimes appears to have been rather honorific (as in the case of several nineteenth century curators who are not known to have contributed significantly to botanical activities at the institution). Early curators were essentially avocational scientists who lived off their personal wealth or who earned their living outside of the institution. There was a gradual transition to the university-trained, salaried, professional curators of today. Much of this change, from avocational to self-sustaining vocational curator, came about during Eastwood's tenure as curator of botany. Without the income she received from her property in Colorado, she might have found it much more difficult to make a living and undertake extensive field expeditions on her curator's salary early in her Acad-

emy career. By the time she retired, however, the institution was hiring Ph.D.-level curators to undertake careers as research scientists at the Academy. With the hiring in 1982 of a professional collections manager to supervise the Department's technical staff and collections, curators had more time to devote to their primary functions and to assume new duties (e.g., supervising students).

Research trends in the plant sciences toward increased specialization and away from field- and herbarium-oriented studies to those based primarily or partially on molecular data (e.g., Lammers 1999; Gropp 2003) are reflected by the research of Academy botanists. Early curators were botanical generalists: Kellogg and Brandegee worked on vascular plants, non-vascular plants, and fungi. Eastwood, Howell, McClintock, and Breedlove studied diverse vascular plant families. Current curators mostly specialize on a particular family (or small group of families) for their careers. The emphasis on floristic research that was critical to understanding California's unique biodiversity yielded (at least partly) to revisionary and monographic studies within a particular family based on morphological attributes. In recent years, phylogenetic analyses based primarily on molecular data have become either a component of monographic studies or the primary focus of investigations.

Relationships with other Centers of Botany in the Bay Area

Until the founding of the University of California in 1868, the history of resident institutional botany in California was the history of botany at the California Academy of Sciences. As other academic centers formed and grew in northern California, there were naturally periods of cooperation as well as times of personal and institutional rivalries. Fortunately, the former have far exceeded the latter in recent years. There have been professional botanical interactions between the Academy and most of the colleges and universities in the San Francisco Bay Area (especially with the University of California, Stanford University, and San Francisco State University). Behr taught classes at the University of California's medical school; Academy botanist Greene became the first professor of botany at the University of California, Berkeley; and Kellogg, Bolander, Harkness, and Gibbons had all offered botanical courses in Berkeley (Constance 1978). Some Stanford botanists have served as Academy curators (e.g., Dudley and Thomas). McClintock taught at San Francisco State for a brief period and the current curators all have academic appointments there. Academy-nurtured Raven became a third-generation graduate of Berkeley in 1957, then taught at Stanford, while maintaining strong linkages to the Academy, from 1962–1971. The well-documented rivalry between Greene and his former Academy colleague Curran/K. Brandegee was passed on, to some extent, to Greene's student and successor Jepson and Brandegee's protégé Eastwood. Eastwood had supporters in Berkeley, however, and she was generously offered working space there following destruction of the Academy's herbarium. Botanists from both the University of California and Stanford University have participated in numerous Academy expeditions. Prominent botanists from nearby universities have served on the Academy's Board of Trustees (e.g., Lincoln Constance from the University of California and Ira Wiggins from Stanford University, both of whom served as President of the Academy) and many local botanists have been elected Academy fellows.¹⁴²

Because the collections at the Academy and those at the University of California, Berkeley and San Francisco State University¹⁴³ are largely complimentary rather than duplicative, it remains in the best interests of systematic and evolutionary botany that botanists at these institutions continue to cooperate, provide mutual support, and direct the growth of their respective herbaria in unique directions. In this way, a comprehensive and multi-institutional botanical resource, based on both public and private funding, is maintained in the San Francisco Bay Area.

Research Results

For 150 years, the focus of botanical activities at the Academy would be determined by the specific interests of its botanical curators. Research activities of the curators have emphasized systematic studies based on fieldwork and herbarium investigations, i.e., collections-based organismal botany. Because California's plant life was largely unknown at the middle of the nineteenth century when the Academy was founded, it is not surprising that for the remainder of that century and for much of the next, Academy botanists concentrated their efforts on documenting and describing the state's flora.

As the flora of California became better known, the research interests of Academy curators spread to other parts of the world. Major Academy expeditions with a botanical component were summarized for the first hundred years of the institution by Munz (1953). These included a series of expeditions to Baja California beginning in 1888 with T. Brandegee often serving as the plant collector; the 1903 expedition of the schooner *Mary Sachs* along the west coast of Baja California and to the Revillagigedo Islands with botanical collector Frederick E. Barkelew; the 1905–06 expedition on the schooner *Academy* to the Galapagos Islands with botanist Alban Stewart (Fig. 20); the 1921 expedition to the Gulf of California on the schooner *Silver Gate* with botanist Ivan M. Johnston; the 1925 expedition to the Revillagigedo Islands and other islands and localities in western Mexico on the U.S.S. *Ortolan* with botanist Herbert L. Mason; and the 1932 Templeton-Crocker Expedition to the Galapagos Islands with botanist John T. Howell (Fig. 21C). A series of expeditions to the peninsula (and associated islands) of Baja California, Mexico, mostly under the auspices of the Belvedere Scientific Foundation¹⁴⁴ and including Academy personnel as well as botanists from Stanford University, the San Diego Natural History Museum, and the University of California, were undertaken from 1958 to 1972 (Lindsay 1983). These activities highlight long-standing and continuing interests by Academy botanists in the Galapagos Islands, the peninsula of Baja California, and islands off the west coast of Mexico.

Recent major botanical expeditions emanating from the Academy have gone even farther afield and include those to Madagascar in 1998 (with Academy botanists Almeda, Daniel, de Nevers, and Fritsch) and Yunnan, China in 1998–2003 (with Academy botanists Bartholomew, Bourell, Fritsch, Shevock, and Zhou).

Most publications emanating from scientists in the Department have been in the areas of floristics and monographic/revisionary taxonomy. Ornamental plants were of significant interest to Eastwood and were the major subjects of study for McClintock. In recent years, the use of molecular techniques (especially DNA sequence data) in addressing systematic and evolutionary questions about plants has become prevalent among the Department's botanists. Munz (1953) summarized the Academy's major contributions to botanical literature during its first hundred years. In addition to botanical publications, both by Academy scientists and others, in the institution's official serials (*Proceedings*, *Bulletin*, *Occasional Papers*, *Memoirs*), two privately-financed journals emanated from staff members (*Zoe* and *Leaflets of Western Botany*; Fig. 29) as discussed above. Since 1953, some of the major botanical contributions published by the Academy include: Almeda and Pringle (1988), Axelrod (1979), Dakin (1954), Daniel (1997), Gentry (1978), Lott (1993), McClintock (1957), McClintock et al. (1968), Moran (1996), and Walther (1972). The series of taxonomic accounts comprising the *Flora of Chiapas* is also an on-going departmental project with five parts (Introduction, Pteridophytes, Malvaceae, Acanthaceae, and Compositeae-Heliantheae s.l.) published between 1981 and 1999.

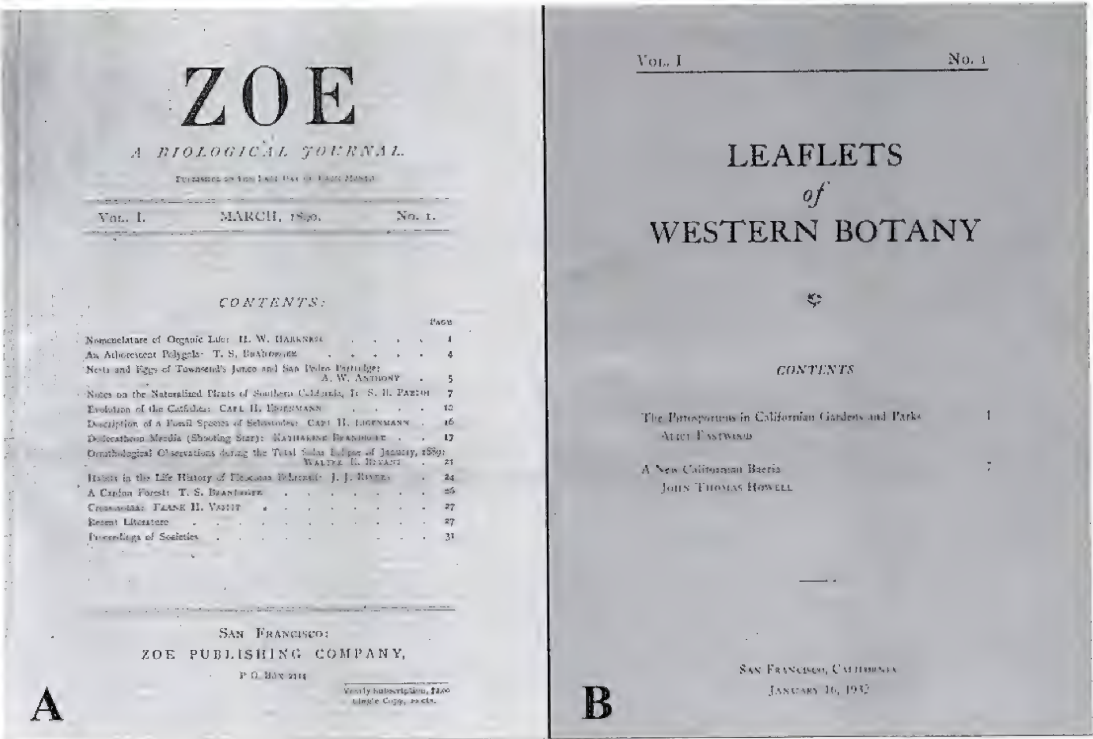


FIGURE 29. Private botanical journals emanating from the Department of Botany. A. *Zoe* (1890–1908), owned and largely edited by the Brandegees; the journal moved with them to San Diego. B. *Leaflets of Western Botany* (1932–1966), owned and edited by Eastwood and Howell.

Meeting the Challenge

From its earliest years the Academy has been what botanical historian Joseph Ewan characterized as a “Mecca” for naturalists on the Pacific Coast of North America. Indeed, it was and continues to serve as a major resource (via staff, plant collections, laboratories, and library) for both amateur plant enthusiasts and professional botanists. But by its sesquicentennial, the Academy had added another major dimension—that of a formal training center with proactive educational opportunities for both amateurs and professionals. New programs developed at the institution during the past 50 years include: docent training, adult and family education classes, workshops for science teachers, natural history tours, endowed internships, an undergraduate institute in systematics, and graduate assistantships for students pursuing advanced degrees at the Academy. All of these programs include a significant botanical component through the Department of Botany. Together, these programs seek to inform the public on biological issues and to help train the next generation of scientists.

Reflecting on the Academy’s first hundred years, Howell (1953:99) noted, “The growth of the present herbarium has been impressive,—from a few hundred specimens in 1906 to over 370,000 in 1953. But knowledge (*scientia*), not size, is the end for which we strive. Unless an herbarium serves as a basis for study and for published research, it is little more than a well-ordered hay-stack. In its first hundred years, the Academy herbarium has met and answered the challenge of the science it serves. In 1953, it enters upon its second hundred years with the expectation and hope that its scientific usefulness will be augmented and ever more fully realized.” Now, half way through

those second hundred years, I think Tom Howell would be very pleased with the myriad accomplishments of his successors at the Academy, the continued growth of the botanical collections, the new emphases on formal training, and the usefulness and relevance of the Department's resources to science, conservation, and humankind.

By the end of the twentieth century space limitations throughout the Academy and building restrictions imposed by the city of San Francisco forced the institution to reconsider its existing campus in Golden Gate Park. Plans to build a new facility at its existing site in the Park were deliberated upon and finalized by 2003. In order to demolish the existing campus of more than 10 buildings and rebuild an integrated facility in the Park, the institution relocated to a temporary site in downtown San Francisco in 2004. Completion of the Academy's new home in Golden Gate Park is slated for 2008. In conjunction with the move to temporary quarters, there was a reduction in the level of support staffing in the Department of Botany. The new facility in the Park will provide more space and new cabinetry for collections, climate controls for specimen preservation and pest management, and additional space for the various Academy and departmental initiatives (e.g., training students, projects in Madagascar and China). When relocated back to the Park, the Department of Botany also looks forward to restaffing at previous levels and adding an additional curatorial position (i.e., the John Thomas Howell Chair in Western American Botany). It is anticipated that, as in the past, future growth of the botanical collections will continue to be largely dictated by the interests of the Department's staff. Although relocation of the Department to interim quarters (with reduced staffing and space) presents challenges and frustrations, we know that we have a courageous and colorful past on which to draw, and we anticipate a bright future with new opportunities, systematic techniques, and personalities.¹⁴⁵

NOTES

¹ Some interesting observations/perspectives on what was and was not available in San Francisco at the time of the founding of the Academy were recorded by Charles B. Turrill in his 1918 Academy lecture, "The Early Days of the Academy" (an undated typescript of which is in the Academy's library). Turrill became a member of the Academy in 1870 and knew many of its early members (Leviton and Aldrich 1997).

² References to Hittell's manuscript are cited as "Hittell 1997"; references to footnotes and other information provided by the editors are cited as "Leviton and Aldrich 1997."

³ The institution was initially called the California Academy of Natural Sciences. "Natural" was dropped from the name in 1868 (Hittell 1997:95).

⁴ California had been under Spanish claim and rule from the 1540s until 1821 when Mexico became independent from Spain. Mexican California was ceded to the United States in 1848 following the U.S.-Mexican War of 1846–1848. It became the 31st state of the United States in 1850.

⁵ An account of this violent affair was given by Robert O'Brien in his column, "Riptides" in the *San Francisco Chronicle* of 2 May 1947, under the title, "The Scientist and the Gambler." In the early days of the nearly lawless coastal area of San Francisco, known as the "Barbary Coast," extralegal community groups or vigilantes formed to suppress civil disorder. Academy botanist H.G. Bloomer was active with the Committee of Vigilance (fide 5 April 1896 letter from H.R. Bloomer to W.L. Jepson in the H.G. Bloomer archives, C.A.S. Special Collections).

⁶ Early meetings of the Academy were described by one participant (Bosqui 1952:53) as, "sometimes more grotesque and amusing than scientific, and were not always harmonious; but on the whole were very interesting and instructive."

⁷ See McKelvey (1955) for a summary of Kellogg's alleged travels with John J. Audubon.

⁸ He was elected first vice-president in 1856, vice-president in 1870, librarian in 1867–1869, and director of the museum in 1875 (Hittell 1997). See Appendix 1 for the years he served as a curator.

⁹ Ewan (1953) noted that these collections were destroyed in a flood at Sacramento shortly after his arrival in California.

¹⁰ During its first years, the Academy's proceedings were published in such outlets as *The Pacific* and the *Daily Alta California*, both newspapers (Leviton and Aldrich 1997:33). See also note 28 below.

¹¹ The period from 1877 to 1884 was a time of financial and political instability at the institution during which no regular scientific series (i.e., *Proceedings*) was published. In 1884, the *Bulletin of the California Academy of Sciences* was issued, and its two volumes covered the years 1884–1887. In December of 1887, publication of the *Proceedings* (as "Second Series") was resumed (Brandege 1893a; Leviton and Aldrich 1997; Ertter 2000).

¹² An annotated list of species proposed by Kellogg, and several other early Academy botanists, was published by Curran (1885). This number of species described by Kellogg appears reasonably accurate. In a conservative estimate of the number of species effectively published by Kellogg (i.e., excluding those proposed by Kellogg but effectively published by someone else) using The International Plant Names Index at <<http://www.ipni.org>> accessed on 31 December 2006, I counted 207 species.

¹³ Ertter (2000) provided an interesting discussion of the Academy's battle for scientific recognition (specifically with respect to priority of publication of new species by Academy scientists in Academy publications or local newspapers) from scientists in the eastern United States and Europe. See also Hittell (1997), Leviton and Aldrich (1997), and note 28 below.

¹⁴ Kellogg's decision not to bequeath his illustrations to the Academy is usually attributed to his opposition to the Harkness presidency at the institution in 1887 (see note 28 below). At the members' meeting of 17 December 1888, Hittell (1997:299), who was present, noted, "Dr. William P. Gibbons read a paper 'regarding the drawings of the late Dr. Albert Kellogg and his reasons for not leaving them to the Academy while the present administration was in power.' After a great many desultory remarks, it was, on motion, resolved that the paper was not in proper tone and should not be received by the Academy." For whatever reasons, Kellogg purposely chose not to leave his botanical drawings to the Academy. This is somewhat ironic because in 1856, Kellogg had supported a resolution that would have required the deposit at the Academy of all specimens or drawings on which publications emanating from the "departments of Zoology and Botany" were based (Hit-

tell 1997:48). Had that resolution passed, Kellogg's drawings would presumably have been deposited at the institution. It is also of interest that Kellogg and W.P. Gibbons had either maintained their friendship since their early days at the Academy or had reestablished it following Gibbons' involvement with the organization in the 1860s. Kellogg appears to have been largely responsible for Gibbons' removal from the office of corresponding secretary in 1855, which event led to Gibbons's lengthy disassociation from the Academy (Hittell 1997).

¹⁵ The first 44 pages of this work contain 24 of Kellogg's drawings accompanied by Greene's botanical text. The text and illustrations are preceded by former Academy president and Kellogg's Alaskan traveling companion from 1867, George Davidson's "Sketch of the life and work of Dr. Kellogg." Independent publication of this work at the instigation of several Academy members, was not without controversy at the Academy (e.g., see Hittell 1997:303).

¹⁶ See note 138 below for information on Parish.

¹⁷ No details were recorded by Hittell (1997) as to whether there was any dissention, or what discussion ensued.

¹⁸ Indeed, early curators at the institution drew their salaries from their professional lives outside of natural history.

¹⁹ Trask was not related to Blanche Trask (1865–1916), who collected and studied the flora of the California Channel Islands. She donated numerous items from the Channel Islands, including plant collections, to the Academy, and was elected to membership in 1904 (Hittell 1997).

²⁰ According to Charles B. Turrill (page 12 of his typescript, see note 1 above), the Academy was offered 10 acres of land for a botanical garden in the new city of Clinton. "The offer was held under consideration while other localities were given an opportunity. While, no doubt, the Academy would have willingly established a botanical garden, provided means for it could be obtained, yet the members seem to have been unwilling to have the institution used as bait in a real estate deal. Where was Clinton? True the Academy has survived it. Few even remember the place. Its streets were surveyed beyond Oakland. Badger's Park was there years after." Hittell (1997:494) offered a somewhat less cynical perspective: "... it appeared that, while the maintenance of a Botanical Garden in Alameda County might be a great gain to the prospective City of Clinton, it would be a millstone around the neck of the struggling Academy, which was barely able to keep its head above water as it was; and the proposed magnificent donation was respectfully declined with thanks for the offer."

²¹ No collections attributed to Andrews are extant in the Academy's botanical collection. In the Torrey Herbarium at NY, there exists at least one collection made by "Dr. Andrews" in California. Andrews' specimen was apparently used by Torrey in the protologue of *Clintonia andrewsiana* Torr. (see Fig. 5B). Therein, Torrey (in Whipple, Pacific Rail. Rept. 4(4): 150. 1857 ["1856"]) noted, "The only specimens of this interesting plant found by Dr. Bigelow have the flowers scarcely expanded; but we fortunately, while this report was in press, received it in a more advanced state from Dr. Andrews, lately of California, and to this gentleman, who has assiduously examined the botany of that State, we dedicate the species. No ticket accompanied his specimens, but they were probably collected not far from San Francisco." Several other California plants (e.g., *Cirsium andrewsii* (A. Gray) Jeps., *Galium andrewsii* A. Gray), were named for him. "Dr. Newberry" refers to J.S. Newberry (1822–1892), geologist, physician, and naturalist-explorer who collected plants in the western United States. Following his work for the Williamson Pacific Railroad Survey expedition in 1855, which explored the lands between San Francisco Bay and the Columbia River, he settled for a time at Columbian College (now George Washington University) in Washington, D.C. to write his report on the expedition. Much of his herbarium, possibly including collections of Andrews, is at US and F (*Regnum Vegetabile* 109:590. 1983; for biographical information on Newberry, see <<http://www.mnh.si.edu/vert/fishes/baird/newberry.html>> and <<http://famousamericans.net/johnstrongnewberry/>>).

²² Letters of 8 June 1855, 7 August 1855, and 4 September 1855 from Andrews to Torrey are deposited in the Torrey correspondence at the New York Botanical Garden.

²³ Deborah Lewis of the Iowa State University Herbarium kindly provided additional information from a 1927 "Report on the Herbarium of Iowa State College" by L.H. Pammel, I.E. Melhus, and R.I. Cratty concerning Andrews' collections at that institution. On page 4 of that report, they noted that "Some twenty-five

years ago [i.e., from 1927], Dr. T.L. Andrews, a citizen of Mount Pleasant [Iowa] who had spent some time in Kansas, Louisiana, Tennessee, Brazil, and the islands of the Pacific, and Monterey, California, gave me his collection a short time before his death. He located at Monterey when it was the capital of California. This was soon after California became a part of the United States. The collection, therefore, proved to be a most valuable one." On page 17 the report indicated, "1847-1850. Six collections were made in Louisiana and Monterey, California, by Dr. T.L. Andrews." Other biographical information on Andrews noted herein is derived from the Biographical Review of Henry County, Starr's history of Cornwall (Connecticut), and the newspaper article from 1902 (a copy of which was kindly supplied by Ms. Lewis), all of which are cited in the text. These three sources contain many more details of his eventful life and collecting localities, but do not mention his affiliation with the Academy.

²⁴ Hittell (1997:40) indicated that "Dr. Behr appears to have been elected curator of botany, though the record is silent as to what had become of his predecessor in that position." In fact, his predecessor had departed San Francisco in the previous month.

²⁵ The California College of Pharmacy was organized in 1872 by the California Pharmaceutical Society and Behr was appointed as a professor of botany there in the same year (Legge 1953). The College soon became affiliated with the University of California.

²⁶ In 1969, ten percent of the residue of Margaret D. Bloomer's estate was presented to the Academy for the purchase of botanical books in memory of H.G. Bloomer in accordance with her will. Richardson (1970) recorded an interesting and detailed account of Bloomer, his descendants, and the fortune amassed through real estate speculation (\$20,402 of which established the Bloomer Book Fund in the Department of Botany).

²⁷ The extant records do not indicate who officially served as curator of botany in 1857.

²⁸ Although known to pre-Columbian Americans, the "discovery" of the Sierra redwood by non-natives was summarized by Peattie (1953) and Ewan (1973). Kellogg had received sterile samples of the species in 1852, but delayed publishing a description of the plant for which he lacked reproductive structures and which he had not seen alive. He did show the specimens at the Academy to William Lobb who had come to California to collect plants for a British nursery firm. Soon thereafter, Lobb located plants in the Sierra Nevada; collected seeds, fertile herbarium specimens, and living stock; and returned to England where he presented the specimens to John Lindley. Lindley quickly published Lobb's description of the plant, and named it *Wellingtonia gigantea*, in honor of the Duke of Wellington who had defeated Napoleon at Waterloo. Kellogg had intended to name the plant, "Washingtonia," for a hero of the United States, George Washington. Members of the Academy were not pleased with this sequence of events that resulted in their having "lost" priority for naming the species of the largest known plants. Another episode involving naming and priority of the discovery of some viviparous fishes also occurred at this time. At the meeting on 27 March 1854 (Hittell 1997:27-29), as a direct result of these perceived injustices, it was unanimously resolved, "that in view of the isolated condition of this Academy from other societies that we will regard every publication of new species which has been, or which may be made through the daily papers of this city, as substantial evidence of priority of discovery." Considerable angst and much discussion (including letters and publications) followed on the subject of the scientific name that should be applied to the species of giant trees from the Sierra Nevada. In print, the mild-mannered Kellogg referred to the plant as "the great Washington cedar" and indicated that this was "the earliest among common names, and claims precedence, by all courtesy, in point of time, as also in appropriateness of honor" (Kellogg 1882:19). Because of subsequent international nomenclatural regulations and taxonomic assessments, the species would become known botanically as *Sequoiadendron giganteum*—the generic name ultimately, and perhaps most fittingly, honoring a native American (Sequoia, a distinguished Cherokee chief). The tangible results of the disputes over priority in publication resulted later that year in the Academy's publishing its *Proceedings* as a scientific series, separate from the local newspapers in which they had previously appeared.

²⁹ Bloomer and others were on a collecting trip to Marin County (just north of San Francisco, across the Golden Gate) in September 1874, lost their way, and spent the night outdoors. At age 53, Bloomer died shortly thereafter, apparently partly as a result from over-exertion and exposure during the trip (Richardson 1970).

³⁰ Although funding for the botanical component of the Survey was eliminated in 1864, Bolander was hired to collect plants in regions of California where Brewer had not already done so; according to Ewan

(1953), he became "State Botanist" at this time.

³¹ The botanical volumes of the Survey, essentially California's first comprehensive floristic account, were eventually published in 1876 and 1880 at the expense of a group of interested and wealthy citizens. The treatments were prepared by Brewer, who worked on them from his position at Yale; Sereno Watson, a botanist at Harvard who was familiar with the western flora; and Asa Gray, one of North America's principal botanists. See Ertter (2000) and Beidleman (2006) for accounts of the Survey—including its personnel, activities, accomplishments, and demise.

³² Sets of the Survey's plant collections are extant at Harvard's Gray Herbarium (GH), the University of California's herbarium (UC), and the Smithsonian's National Museum of Natural History (US). If a set was deposited at the Academy, as originally intended, most of them would have been destroyed in the 1906 earthquake and fire that devastated the Academy's herbarium. Among the type collections currently extant at the Academy, there are 55 collections of Bolander. Twenty-six of these are in the Dudley Herbarium (DS, which was incorporated with that of the Academy subsequent to the earthquake). Among specimens in CAS, 13 were received subsequent to the 1906 earthquake, but 16 of them were among the specimens saved by Eastwood in 1906 as recorded on her list. Also among extant types in the Academy's herbarium are 22 collections of Brewer, 13 in DS and nine in CAS. Two of the nine CAS collections were among the specimens saved by Eastwood in 1906. None of the specimens collected by Brewer and Bolander that were present at CAS prior to 1906 bear the "Geological Survey of California" labels that are present on specimens at UC, GH, and US. Rather, labels on these CAS specimens (e.g., Figs. 3C–D, 7A–B) are either California Academy of Sciences labels or handwritten labels bearing no organizational name. Duplicates of all 18 Bolander and Brewer specimens at CAS that were saved by Eastwood were sought at UC to compare labels and data. Of the six that were located there, most have printed "Geological Survey of California" labels, but a few have labels produced at a later time. None have "original" labels like those at CAS. Some of the information on labels at UC differs from that on labels at CAS: the label of *Hieracium bolanderi* at CAS lists the collectors as Bolander and Harford, whereas that at UC lists only Bolander; the label of *Lessingia leptoclada* at CAS does not provide a collection number whereas the label at UC does; the label of *Garrya buxifolia* at CAS notes that the collection was made by Bolander and Harford (with no number cited) in Mendocino and the southern part of Humboldt counties whereas the label at UC notes that *Bolander 6579* was collected in "Red Mts., Mendocino Co.;" the label of *Lathyrus torreyi* at CAS notes that Bolander's collection was made in Mendocino County whereas that at UC notes that it was collected "in thickets near the coast, Humboldt Co., Shelter Cove." in 1867; and the label of *Mitella ovalis* at CAS notes only that Bolander's collection was made in Mendocino County whereas that at UC notes that it was made near Noyo (in Mendocino County) in 1867. While it is possible that some of these collections may not represent true duplicates, it is certainly the case that more information is found on some specimens than others. Determinations of isotypes involving California Geological Survey specimens should involve the comparison of data (and plants represented) on the various specimens concerned. The pre-1906 specimens of Bolander and Brewer at CAS are undoubtedly remnants of a set (possibly the original set) of Geological Survey specimens that were deposited at the Academy before the bulk of the materials were sent East to be studied. Whether this set represented a complete set of the Survey's collections remains unknown. There are numerous specimens at the Academy with printed "Geological Survey of California" labels (many of which were received from US), that came to the institution subsequent to 1906. Thus, a subset (of unknown magnitude) of the Geological Survey specimens resides at CAS.

³³ Harkness was elected as president from 1887 through 1895. He was originally elected as an "opposition" candidate amidst considerable controversy at the Academy. Some opposition to his continued presidency appeared during his tenure in office (e.g., there were several "opposition ballots" or "opposition candidates" offered during the annual elections; Hittell 1997). Indeed Harkness was sometimes blamed for the rancor and internal divisions that prevailed at the Academy during his tenure there (e.g., Bosqui 1952; see also note 38 below).

³⁴ Kellogg was also interested in fungi and presented several mycological papers to the membership (Hittell 1997).

³⁵ Most of these specimens were destroyed in the 1906 San Francisco earthquake and fire (but see note 73 below regarding Harkness types that were saved). When the Dudley Herbarium of Stanford University was incorporated with that of the Academy, most of the fungal collections from both institutions were deposited

at BPI; the CAS collection of macrofungi from Chiapas and the Robert Orr collection of macrofungi were subsequently transferred to NY in 2001. The Chiapan collections were mostly those of D.E. Breedlove. Robert T. Orr (1908–1994) was a curator of ornithology and mammalogy at the Academy and had an interest in fungi. He informally curated the fungal collections in Department of Botany for many years and bequeathed his personal collection to the Academy.

³⁶ Although it is established that Moore was born on May 8th, the year of his birth is uncertain. Because the minister who baptized him died, the church with its records of births was destroyed by fire, and his mother and the birthing nurse subsequently disagreed on the year (his father apparently agreed with the nurse), the year usually given (1841) might be off by one (according to a letter dated 3 January 1934 from J.P. Moore's widow, Charlotte D. Moore, to J.H. Barnhart, a copy of which is in the Eastwood archives, C.A.S. Special Collections).

³⁷ Among the George Davidson papers at the University of California's Bancroft Library in Berkeley there are 16 letters written by Moore between 1881–1890, primarily to Davidson. Some anecdotal and circumstantial evidence that Rev. Moore and Academy mycologist Moore were the same person can be found among several biblical quotations noted in his letters to Davidson. For example, in disparaging conditions at the Academy of Sciences of Chicago, he noted it is "in the condition of one of the Seven Churches about whom the Apostle John writes in Revelation, it 'has a name to live and is not.'"

³⁸ As stated in two letters to Davidson (20 September 1886 and 2 November 1886, both preserved in the Davidson papers at the Bancroft Library), Moore indicated that his resignation was prompted by his extended absence from the Academy combined with the need to have a quorum at meetings of the institution's governing council. These and other letters reveal his sympathies and alliances in the internal political struggle that took place at the institution in the 1880s (see note 33 above). The exact nature of these problems was not revealed by Hittell (1997), who merely noted that antagonism between president George Davidson and first vice-president H.W. Harkness had been growing for some time prior to the annual election of officers in January 1886. This antagonism, "which to a considerable extent involved their friends" (Hittell 1997:227), resulted in an opposition slate of candidates at this election consisting of Moore for first vice-president and John T. Evans for second vice-president. Both opposition candidates were elected, replacing Harkness and H.H. Behr respectively. Moore greatly admired Davidson, and in letters to him made references to "fungoid growths" at the Academy and "our ancient fungoid friend," undoubtedly in reference to Harkness. Moore allied himself with Harford, Kellogg, G.E. Gray, W. Churchill, and C.G. Yale. His disassociation from the institution likely resulted, at least in part, from Harkness's ascension to the presidency, on another opposition slate, in the "hotly contested" election of 1887.

³⁹ Letter of 24 October 1933 from Charlotte D. Moore to Alice Eastwood; copy on file in Eastwood archives, C.A.S. Special Collections.

⁴⁰ The Association was organized in San Francisco in 1876 to seek improvement in insurance matters; it was later renamed the Insurance Underwriters Association of the Pacific; and in 1966 the name was changed to the Insurance Educational Association (fide IEA website: <<http://www.ieatraining.com/about/index.asp>>, accessed 28 June 2006).

⁴¹ Jones (1933) contended that she was born in Carson City, Nevada, but her autobiographical notes, as quoted in Setchell (1926), indicate otherwise.

⁴² Because there were other women successfully practicing medicine in San Francisco at that time (Ertter 2000), her giving up medical practice cannot be attributed solely to the fact that she was a female doctor. Setchell (1926) merely stated that she did not find the practice of her profession lucrative. Curran allowed only that, "a young doctor is not usually overrun with patients" (quoted in Setchell 1926:167). It is possible that her temperament and growing interest in botany conspired with financial realities and lead to a change in profession.

⁴³ Among those first women was Sarah A. Plummer, an amateur botanist and plant collector, who later married John G. Lemmon.

⁴⁴ Salaries for curators at that time were the exception rather than the rule. Curators were still expected to draw their salaries from their professional lives outside of the institution. In awarding her a salary, the Council of the Academy noted the time and expense she had already contributed to curating the herbarium.

The funding given Curran in 1883 does not appear to have been an on-going salary, but rather an ad-hoc action of the Board of Trustees. There is no mention of Curran having received such funding in 1884; however, beginning in 1885, she (along with Kellogg and Greene) received annual payments as determined by the Trustees (Hittell 1997).

⁴⁵ The *Bulletin* was instituted in 1884 because publication of the *Proceedings* had been suspended and some institutional publication outlet was needed (see note 11 above).

⁴⁶ According to Curran (subsequently K. Brandegee; as quoted in Setchell 1926:168), soon after its inception, "Dr. Harkness found it too expensive and Mr. Brandegee took over the control, repaying to Dr. Harkness the sum that he had expended. Highly opinionated commentator Marcus Jones (1933:16) described *Zoe* as "the only highclass magazine on the Pacific Coast." Although it was privately owned, 50 copies of the first two volumes of *Zoe* were offered to the Academy "to be distributed among the principal scientific societies of the world with which the Academy was in correspondence 'in grateful acknowledgment of favors granted to the California Zoological Club and the California Botanical Club'" (Hittell 1997:335). *Zoe* also published a summary of the Academy's activities under a section entitled "Proceedings of Societies."

⁴⁷ She was editor of volume 1 of the second series of *Proceedings of the California Academy of Sciences*, the first papers of which were issued in 1887.

⁴⁸ Greene's eventful life (including his collecting plants while serving as a Union private during the Civil War, his conversion to Catholicism and subsequently being locked out of his Episcopal church in Berkeley, and his post-Berkeley days at the Catholic University and Smithsonian Institution in Washington, D.C.) makes for interesting reading.

⁴⁹ By then, after her marriage to T.S. Brandegee, she was known as K. Brandegee.

⁵⁰ Was this Bruyn Hasbrouck Davis (1827-?) whose brother, Horace Davis, was a San Francisco businessman, politician, and university administrator? Horace Davis was proposed for membership in the Academy in 1894, and in 1903 he was appointed to a committee charged with overseeing the establishment and awarding of an Academy medal for agricultural advancement (Hittell 1997). The Davis brothers were sons of Massachusetts governor and senator, John Davis (Estabrook 1908). Paradoxically, Bruyn Hasbrouck Davis (born Worcester, Massachusetts; graduated Williams College in 1845 and thereafter studied in Germany; taught high school in Worcester; became pastor of the Unitarian Society in Watertown, Massachusetts in 1849; studied law and admitted to the bar in Massachusetts in 1854; moved to Chicago in 1855; mustered into the army of the United States in 1862 as lieutenant colonel of the 11th Illinois cavalry; served with distinction, and at close of the Civil War was brevetted brigadier general; after returning to Chicago, he was elected city attorney) was reported as lost on a voyage to Ireland aboard the steamer *Cambria* in 1870 (<http://famousamericans.net/johndavis4/> accessed: 27 June 2006). I have been unable to reconcile his apparent death in 1870 and his Academy activities nearly 20 years later; no others in the Davis family with the name "Hasbrouck" were noted by Estabrook (1908). In spite of various coincidences, it would appear that Academy curator Hasbrouck Davis and Bruyn Hasbrouck Davis were not the same person.

⁵¹ She was a strong supporter of Harkness, who was perceived by some as rather high-handed and outspoken (e.g., Bosqui 1952).

⁵² He had received a legacy of \$40,000 (Jones 1933) sometime after arriving in California. Ewan (1942) speculated that receipt of these funds likely helped to influence Brandegee to give up survey work in favor of botany.

⁵³ This is not to be confused with the California Botanical Society, which was founded 22 years later (1913) in Oakland by W.L. Jepson. The California Botanical Club was founded on 7 March 1891 in response to a call from: Harkness, Behr, Eisen, K. Brandegee, T. Brandegee, Mary W. Kincaid, and Agnes M. Manning. They sought "to promote the study of plants, especially those found on the Pacific Coast of North America, and by bringing into more intimate relations the botanists of the Coast to arouse a greater interest in so rich a field of science" (Anonymous 1891b:93). This was the first botanical organization on the Pacific Coast of North America. Membership soon surpassed 100 and included professional botanists, prominent avocational botanists, and local plant enthusiasts. Meetings included presentation of botanical papers and field excursions to local sites. The Club met at the Academy and supported the institution by providing specimens for its herbarium (via collections and purchases). Membership dues to the Club included a subscription to *Zoe* (East-

wood 1941), and thus the Club helped to finance that journal. Although K. Brandegee was apparently never president of the Club, it is clear from later references (e.g., Eastwood 1941) that she was the active force behind it. Eastwood assumed leadership of the Club following Brandegee's departure from San Francisco in 1894. The Club became increasingly social in its activities, although a botanical lesson or discussion was always at the center of its gatherings and field trips. By 1913 (following destruction of the Academy's buildings and resources in 1906) membership in the Club numbered about 50. They met weekly, alternatively at the Academy and on excursions in the field. The Club helped the rebuilding efforts in the Department of Botany by providing volunteer labor and by purchasing specimens and library materials that had been destroyed in 1906. It also helped to finance Eastwood and Howell's *Leaflets of Western Botany* (Eastwood 1941). Howell assumed leadership of the Club in 1953. In unpublished archival records in the Academy's Library and Special Collections, he noted, "As the Club was conducted by Miss Eastwood after the 1906 S.F. Earthquake it was a weekly field trip—an afternoon walk in Golden Gate Park or an all-day excursion out-of-town, generally to Marin Co., less often to the Eastbay or down the Peninsula. This was the *modus operandi* when I first came to the Academy in 1929, but it stopped abruptly when on July 25, 1931, Miss Eastwood was hit by an automobile and was crippled by a broken leg. After her recuperation and return to work at the Academy, the meetings of the Botanical Club became round-the-table discussion meetings in the Botany Dept. and this was the Club activity I inherited after Miss Eastwood's death in 1953. The discussion type of meeting continued but it was a bit more serious, not quite so homey and social." Howell also led the Club's members on extended trips to botanically interesting regions of California (e.g., in 1968, he led the Club on a 6-day field trip across the Sierra Nevada in what was billed by the Club as a "Trans-Sierran Phytogeographic Expedition." The 40 participants in 14 vehicles drove more than 800 miles from sea level to 11,000 feet (Academy Newsletter 345, September 1968). Plant lists were compiled during these botanical outings and Howell usually prepared a trip report for the membership. In the years following Howell's retirement from the Academy, Ann Witter (Gillette) (a longtime member of the Club and Trustee of the Academy) played a major role in running the organization. On the Club's centennial in 1991, Howell and Witter relinquished leadership of the group. Club member and Department of Botany associate Catherine Best took over organizational responsibility for it until 1996. By 1995, regular monthly meetings had yielded to a few field trips each year, a garden party in May, and a Christmas party in December. The last of the Club's major activities were trips to Sonoma County in 1997, including an outing to the Academy's Pepperwood Ranch (C. Best, pers. comm.). The Club's assets were eventually donated to the fund for the Howell Chair in Western American Botany at the Academy.

⁵⁴ The first meetings of the Academy had been in the offices of businessman Lewis W. Sloat on Montgomery Street and attorney Thomas J. Nevins in the Phoenix Block building on Clay Street. Meetings continued in Nevins's office for more than a decade but its quarters there were small and inadequate (Hittell 1997) for the increasing membership and contributions of specimens to "the cabinet." In 1863, Hittell (1997:68) noted that "Professor Bolander was authorized to obtain subscriptions for cases to contain the botanical collections." By 1866, the Academy's various collections had been relocated to a hired room for safe keeping (Hittell 1997) following damage to the Phoenix Block building resulting from an earthquake in 1865. The Academy relocated to rooms in the Donohoe Building on the corner of Montgomery and Sacramento streets in May of 1866, but it is not recorded if or when the collections were moved to that site. By December of that year these rooms had become inadequate and the Academy moved back into repaired and refitted rooms in the Phoenix Block building in time for its first meeting in January of 1867. From 1874 until 1891 the Academy rented the old First Congregational Church building on the southwest corner of California and Dupont (now Grant) streets. There, the herbarium and botanists were located in the gallery of the old church (Anonymous 1922). With the opening of its own building, the Academy's botanical collections were moved from their "dark, dingy, dusty and dilapidated old quarters on Dupont Street to the bright, airy and well-kept galleries on Market Street" (Fig. 13B; Hittell 1997:442).

⁵⁵ Botany, as a discipline, was present at the Academy from the founding of the organization, but it is unclear exactly when the "Department of Botany" came into existence. One can infer that there was a department of botany from the inception of the institution when there was a curator and cabinet of botany. Scientific departments at the Academy, in their modern guise, apparently came about somewhat later, however. Hittell (1997:22) noted that, "The first effort to form a section of the Academy was made on NOVEMBER 21 [1853], when, on motion of Dr. William P. Gibbons, a "Floricultural and Horticultural Department," also

called an "Agriculture and Horticulture Committee," was organized by Gibbons, Kellogg, Nevins, Randall and Bloomer, of which Gibbons was elected chairman and Nevins secretary." Hittell (1997) made no further reference to this section or committee and its creation or demise remains undocumented. Hittell (1997:105) noted that in 1869, as a result of Academy vice-president J.G. Cooper's move to establish divisions of members along disciplinary lines, "Dr. Kellogg proposed a botanical division to include meetings in the field." Based on the lack of subsequent references to such divisions by Hittell (1997), it does not appear that they were formally established at this time. However, in 1876, a committee was appointed to consider "sectionizing the Academy" and their recommendation to create sections of the Academy for particular subjects of study and research was subsequently adopted (Hittell 1997:192). Hittell (1997) noted the formation of numerous sections at the Academy over a period of years, but not one in botany. Among the Academy's historical records, however, there is a ledger entitled "Botanical Section of the California Academy of Sciences. Organized March 31st 1877." This book indicates that a botanical section was organized during a meeting on 31 March 1877 attended by Behr, Kellogg, Harford, Henry Edwards (curator of entomology at the Academy), and Elisha Brooks (for many years treasurer of the Academy). At that organizational meeting, Edwards was elected president of the section, Harford was elected secretary, and Kellogg was elected conservator of the herbarium. Goals of the section were investigation of the flora of California and adjacent regions of the Pacific Coast, registration of localities of rare and little-known plants, formation of a new herbarium, and collection of specimens. The ledger contains minutes of meetings of the section up to 13 October 1877. At the meeting of 14 April it was decided that information about plants found [and presumably collected] by members of the section was to be recorded in a book. This latter catalogue ("Record of the Botanical Section of the California Academy of Sciences. Formed April 1877") is also extant in the Academy's Special Collections (California Botanical Club, Box #1). It contains some 48 pages with information (mostly locality and date) from collections added to the herbarium, including those of Kellogg, Kellogg & Harford, Behr, Eisen, Moore, Edwards, J. Clarke, J. Lemmon, and others. That is followed by a "List of Professor Green's [sic] Species." Notes from the early years of the Academy as reported by Hittell (1997), often make reference to "departments," but this was usually used in the sense of "discipline." This may have been an unintentional mischaracterization on Hittell's part, because in museum director Bloomer's report to the meeting of 3 January 1871 (Proceedings of the California Academy of Sciences 4:156. 1872), he referred to various departments (including a botanical one) in their modern sense. By the early 1880s even Hittell (1997:233) noted that curators were being asked "to hand in lists of all property in their respective departments." In 1892, reference is made by Hittell (1997:338) to "the Botany Department," and thereafter, one finds numerous references to the Department of Botany in its modern sense.

⁵⁶ Jones elevated acerbic critique of his colleagues to a literary style. For example, describing botanist and Academy member C.C. Parry, he stated, "Parry was a typical toady, as most men had to be to get a position in the Government service. He was a suave, well groomed society man with little brains, a great feeder of hot air, who slobbered over the great to keep in their good graces" (Jones 1930:3). For the most part, Jones's had only praise for K. Brandegee: "She was incontestibly [sic] the greatest woman botanist that ever lived" (Jones 1929:16) and "she became a walking encyclopedia on California botany" (Jones 1933:14). A thorough summary of Jones' life, writings, and collecting localities was provided by Lenz (1986).

⁵⁷ Although such critiques might be considered "unprofessional" by current standards, these types of published comments were neither unique to K. Brandegee nor uncommon during this period in which private journals flourished.

⁵⁸ Most of K. Brandegee's collections at the Academy were destroyed in 1906, but duplicates of her collections are extant in herbaria at the University of California and elsewhere (Thomas 1961a).

⁵⁹ I doubt that Ewan was truly offering an accusation against K. Brandegee. Rather than being a "sin" of commission, this was likely one of omission, which was the general practice among plant collectors at the time. Indeed, information on labels of her successors, Eastwood and Howell, is often similarly lacking in details of locality, habitat, and morphological attributes such as habit, plant height, and flower color. Ewan was likely expressing the frustration that many botanists feel about the general lack of data provided on the vast majority of older plant collections.

⁶⁰ Ewan's (1942:773) comments on K. Brandegee's motives for field work (e.g., a focus on recollecting "topotypes" and a preoccupation "to seek out intermediates for proposed new species and depose them and

their proponents in the columns of *Zoe*") might help to explain her later failure to publish the results of her botanical studies.

⁶¹ George Thurber (1821–1890), elected a corresponding member of the Academy in 1863, had been a botanist with the U.S. and Mexican Boundary Survey in 1850–1853. His collection acquired by the Academy, which undoubtedly included a set of his own collections as well as collections of others (e.g., F. Lindheimer; see McKelvey 1955:911), was destroyed in 1906. Surviving sets of Thurber's collections are at US, NY, and GH. See Ewan (1950) for additional biographical information on Thurber.

⁶² Lindsay (1968) indicated that K. Brandegee left the Academy's employ when David S. Jordan became president because she was unhappy with the new regime. It was fortunate that the Brandegees took their personal collections with them when they left the Academy in 1894; otherwise, most or all of them would have perished in 1906.

⁶³ By September of 1900, K. Brandegee's successor, Alice Eastwood, had learned that the Brandegees intended to return to the Bay Area from San Diego, "owing to the enervating effect of the climate" on Ms. Brandegee (Eastwood to K. Brandegee, 6 September 1900, letter preserved in the archives of the University and Jepson herbaria at the University of California, Berkeley). Eastwood graciously indicated to her that, "There is a table for you whenever you may come, a place where you can spread out to your hearts content" (Eastwood to K. Brandegee, 25 September 1903, letter preserved in the archives of the University and Jepson herbaria at the University of California, Berkeley). Brandegee's dependence on Eastwood to supply plants and information from herbarium specimens, as reflected by her frequent requests to Eastwood, suggest that an additional reason for leaving San Diego was to return to a center of botanical activity.

⁶⁴ The Brandegees' personal herbarium consisted of 76,166 specimens (Ertter 2000), largely from California and Baja California, where their respective interests led them on collecting trips. It was rich with type specimens of names they had proposed from these regions. The addition of the Brandegee Herbarium effectively doubled the size of the herbarium at the University of California. Their reasons for donating their botanical legacy to the University of California rather than the Academy have not been recorded. Ertter (2000) provided some interesting speculation on this matter as well as on the post-Academy relationship between Eastwood and K. Brandegee. Ultimately, the Brandegees had originally hoped to receive some financial remuneration for placing their herbarium at the University; although this did not happen, the University had resources that the Academy lacked in the wake of the earthquake and fire of 1906. Katharine Brandegee did not sever ties with the Academy after moving to San Diego. For many years she and Eastwood maintained a correspondence wherein Brandegee was kept informed about botanical activities at the Academy, mutual acquaintances, and Eastwood's field trips (letters from 1894 through at least 1912 are preserved in the archives of the University and Jepson herbaria at the University of California, Berkeley). Eastwood also sent plants to Brandegee, and she researched her mentor's innumerable inquiries about types and other specimens when Eastwood was visiting herbaria in Europe and the eastern United States. Hittell (1997) noted that in 1897, K. Brandegee donated 200 California plants to the herbarium, and that in 1898 she donated 85 species of Mexican plants.

⁶⁵ Thomas (1969) noted that K. Brandegee collected through 1918.

⁶⁶ One might suspect that growing up in this environment in some way preadapted Eastwood for work in a major natural history museum.

⁶⁷ Eastwood's life and activities during her formative years in Colorado have been summarized elsewhere (e.g., Wilson 1955; Gambill 1988).

⁶⁸ According to unpublished archival records at the Academy, in 1894 Eastwood and William R. Dudley (Fig. 11A) were both curators of botany. Dudley (1849–1911) was born in North Guilford, Connecticut and studied botany at Cornell University where he received an M.S. degree in 1876. He had been recruited to Stanford University from the Cornell faculty in 1892. He was elected to membership at the Academy in 1893 and was noted to have presented a paper to the membership in 1901 (Hittell 1997). During his tenure as professor of botany at Stanford, he collected plants in California, built an herbarium, and trained students. Dudley's California collections, the collections he had brought with him from Cornell, his students' collections, and a gift of about 70,000 duplicate collections from William Harvey's personal herbarium (at Trinity College in Dublin, Ireland) became known as the Dudley Herbarium of Stanford University following his death from tuberculosis (Thomas 1969; Ertter 2000). Except for the personal collections that Dudley had brought to Stanford from

Cornell, the entire Dudley Herbarium was eventually amalgamated with the Academy's herbarium. Dudley's personal collections from western New York State presumably remain at Stanford University, although their whereabouts there are not known (S. Thomas, pers. comm.). A genus of Crassulaceae, *Dudleya* Britton & Rose, was named in his honor. Additional biographical and bibliographical information about Dudley is available from Jordan (1911), Thomas (1961a, 1969), and Greene (1981).

⁶⁹ Eastwood received from the Board of Trustees an appropriation of \$87 to defray travel and collecting expenses in 1894 (Hittell 1997). Also, her train fares were provided gratis for the most part. Prior to her resignation, K. Brandegee had arranged for a 1,000-mile free ticket on the Southern Pacific Railroad to be used by the curator of botany (Wilson 1955).

⁷⁰ Summaries of some of Eastwood's collecting activities were provided by Wilson (1953, 1955) and Twisselmann (1967).

⁷¹ In 1896, Eastwood noted that she added between 5,000 and 10,000 plants to the herbarium each year (in a letter to J.N. Rose, quoted by Leviton and Aldrich 1997).

⁷² In fact, the "disagreement" over the title of the "Nob Hill" paper did not appear to greatly disrupt their professional relationship. She was a frequent contributor to *Erythea*; in 1896 Eastwood was listed on the title page of volume 4 as having assisted the editor; and she continued to publish articles in the journal following Jepson's alteration of her title. Indeed, volume 7 of Eastwood's copy of *Erythea* (presented to the CAS library by Eastwood in 1949) was inscribed "Miss Eastwood, with the compliments of W.L. Jepson." They must still have been on fairly good terms in 1900 when in the published notice of the discontinuation of *Erythea*, Jepson thanked Eastwood for her recent services in assisting with the journal. However in 1906, Jepson described her in his notes as, "more cocksure and unscientific than ever" (Ertter 2000:244).

⁷³ This is the figure for the number of herbarium specimens saved noted among records in the Academy's archives and also by Howell (1953) and Wilson (1955). A complete list of the plants saved in 1906 was prepared by Eastwood and is extant in those archives. This is probably the inventory she made of the specimens following their rescue and before they were transferred to the vault in the Crocker Bank that was referred to by Wilson (1955). It reveals that 1,017 "types" of vascular plants and 480 "types" from Harkness' collection of fungi were saved. Other figures have been promulgated (e.g., 1,200 noted by MacFarland et al. (1949) and Lindsay (1968); Evermann (1916) indicated that 1,136 specimens of phanerogams (including 711 types) and 475 types of fungi were saved, for a total of 1,611 specimens). Other specimens from the Academy's pre-1906 collection survived because they were on loan at the time of the fire and were subsequently returned (e.g., most *Gilia*, some *Ptelea*, some *Eschscholzia*, most *Lupinus*, some *Delphinium*).

⁷⁴ See Miller (1942, repeated in Ewan 1955) for a listing of what was saved/salvaged from earthquake and fire.

⁷⁵ Details of Eastwood's heroic efforts in saving plant specimens from the Academy's herbarium have been drawn from several sources including Wilson (1955), a letter from Eastwood to E.L. Greene (see Duncan 2006), a letter from Eastwood to E.W. Nelson (reproduced in Hittell 1997), and her own recollections as reported by Mike Stein in his article for the San Francisco Examiner of 18 April 1953, "Alice Eastwood Recalls Terrible Times in 1906." As with many stories that take on the status of "legend," specific details sometimes vary from one account to another.

⁷⁶ Because of its location in San Francisco, which lies near several major faults associated with the boundary between the North American and Pacific tectonic plates, earthquakes have affected the Academy's herbarium and Department of Botany several times. An earthquake in 1865 damaged the Academy's quarters at 622 Clay Street "to such an extent as to induce those in charge of the library and collections to pack them up and store them where they would not be exposed to the weather" (Hittell 1997:79). In 1868 another serious earthquake shook San Francisco and the resulting economic reverberations threatened the Academy's income (Ewan 1955). Most of the destruction to the Academy's holdings in 1906 was caused by the fire following the earthquake, not from the temblor itself. In a report by Sewell (1907:76) it was noted that the "building had cast-iron concrete-filled columns and Ransome reenforced-concrete floor construction. So far as it was possible to ascertain, no damage was done to the reenforced concrete or to the columns by the earthquake. The building was gutted and the floors considerably damaged by the fire, but the columns were not damaged, and on the whole the building stood very well." The Loma Prieta earthquake of 1989 caused the third floor of

Wattis Hall, where the Department of Botany was located, to shake violently. Free-standing, standard herbarium cases shuffled up to six inches from the walls, books fell from shelves to the floor, library shelving was bent, ceiling tiles fell, and gaps between the closed compactor units opened and shut. Less than a dozen specimens fell to the floor from the compactor units with open shelving. Major damage was sustained in the Hohfeld Botany Library where hundreds of books fell from the shelves to the floor, and the metal shelving was destroyed. For more than a year thereafter, the Hohfeld Botany Library was housed in the Academy's main library. New shelving was purchased and most of the books that were damaged were repaired. In spite of the intensity (7.1 magnitude on Richter scale) of the 1989 earthquake, the Department of Botany sustained no permanent losses as a result of it. Possibly, some of the lessons of 1906 had been learned, yet good luck, improved construction techniques, and the absence of fire undoubtedly figured prominently in preventing more damage in 1989.

⁷⁷ Of these, 45,234 were mounted specimens and 15,476 were unmounted specimens [total = 60,710]; 60,638 specimens were determined whereas 8,832 specimens were undetermined [total = 69,470]; 52,949 were vascular plants and 7,689 were non-vascular plants [total = 60,638]. The total number of species of vascular plants was reported to be 19,586; the number of species of non-vascular plants was 2,838; and the number of genera represented in the herbarium was given as about 3,500. I am unable to derive the total number of specimens noted from the various categories provided, but consider the 74,767 figure to be reasonably accurate.

⁷⁸ Other occupants of the herbarium at that time were the Brandegees and Jepson, a situation that likely made for either very awkward or very interesting interactions (see Ertter 2000 for an example).

⁷⁹ Details of her activities and travels following the 1906 disaster were recorded by Wilson (1955).

⁸⁰ Scattered Academy possessions had been reassembled on one floor of the Security Building at 343 Sansome Street in March of 1910, but accumulating gifts to the herbarium had been stored in the dark basement, where it was not possible to work (Wilson 1955). So Eastwood rented a floor of an old house on Laguna Street where she lived and worked on sorting the accumulating specimens from the basement on Sansome Street. Appropriate space was eventually made available for the herbarium and Eastwood's work at the Sansome Street headquarters of the Academy. With the completion of North American Hall in Golden Gate Park, the collection was moved to its new quarters on the second floor of that building's research wing in 1915.

⁸¹ The schooner *Academy*, bearing its assortment of valuable collections, returned from the Galapagos Islands to San Francisco on 29 November 1906. An extensive report on the plant life of the archipelago and on the botanical collections was published by the expedition's botanist, Alban Stewart, in 1911 (Stewart 1911). This was soon followed by other botanical results of the expedition (Stewart 1912a, 1912b).

⁸² By 1914, 12,000 mounted specimens had been made accessible in the Academy's temporary quarters (Grunsky 1914); by 1916, 20,586 mounted sheets were in the herbarium (Evermann 1916).

⁸³ See Eastwood (1952) and note 129 below. Although the pre-1906 Academy herbarium undoubtedly consisted of a large majority of collections from California and elsewhere in North America, it is abundantly clear from Hittell (1997) that earlier Academy curators, especially Kellogg and Bolander, were active in procuring plants (mainly via exchange or gift) from many parts of the world (e.g., Algeria, Australia, Chile, Europe, Greenland, Mexico, New Caledonia). One such donation noted by Hittell (1997:217) in 1878 was a collection of "plants collected on the Great Wall of China by the late B.P. Avery."

⁸⁴ Eastwood's horticultural activities were summarized by Wilson (1955). Her conservation ethics and activities were outlined by Howell (1954a) and detailed by Wilson (1955).

⁸⁵ Eastwood's collections from her early years in Colorado were donated to East Denver High School and eventually went to the University of Colorado at Boulder. The CU Museum Herbarium's Specimen Database of Colorado Vascular Plants (<<http://cumuseum.colorado.edu/Research/Botany/Databases/search.php>>; accessed 21 May 2007) and the Type Specimen Database of the University of Colorado Herbarium (<<http://cumuseum.colorado.edu/Research/Botany/Databases/typeSpecimens.html>>; accessed 21 May 2007) indicate the presence there of 1,429 Eastwood collections from Colorado collected between 1881 and 1910, with the greatest number of collections (291) for a single year having been made in 1891. Most of her pre-1906 collections at the Academy were destroyed in the fire there, but duplicates of many survive in other herbaria (e.g., A, GH, US). Her subsequent collections and field notebooks are extant at CAS.

⁸⁶ Not to be confused with either Thomas Jefferson Howell (1842–1912, the Oregon botanist) or John Hunter Thomas (affiliated with Stanford University and later with the California Academy of Sciences as a part-time curator of botany).

⁸⁷ Howell worked at the Garden during the summer of 1927 and from June 1928 until March 1929. During September 1927 to May 1928, he was an instructor in botany at the University of California, Los Angeles (Howell 1967).

⁸⁸ Smith (1989) provided an account of Howell's long and distinguished career, including revealing details from his tenure at the Rancho Santa Ana and his hiring by and joint work with Eastwood. Smith was a member of the Botany Club and one of Howell's "disciples." Her article was based largely on interviews she conducted with Howell.

⁸⁹ In Eastwood's "Report of the Botanical Department for 1931 and 1932" (Department of Botany archives, Box 1, C.A.S. Special Collections), she noted, "For publication of new species, interesting notes on introductions to the flora, and other matters of general botanical interest, Mr. J.T. Howell and I started in 1931 'Leaflets of Western Botany,' a small quarterly publication. We hope to make it the leading botanical magazine of the west. At present the subscribers are not sufficient for its support. Mr. Howell and I assume all responsibility, financial and otherwise, since we realize the importance of prompt publication which otherwise could not be secured." In addition to papers by Howell and Eastwood, the journal provided a publication outlet for many others interested in the flora of western North America, including many amateur and young professional botanists. The journal was closed after 10 volumes in 1966, two years before Howell's official retirement from the Academy. A comprehensive index to the journal, compiled by Howell and Anita M. Noldeke, was published in 1968. The journal was owned and published by Eastwood and Howell until Eastwood's retirement in 1949; beginning with volume 6 in 1950, Howell was the sole owner and publisher. Additional funding for the journal was received from various sources (as noted in the volumes) including: the Academy, the Botany Club, and various individuals. Although "*Leaflets*" was a private journal, Eastwood and Howell refrained from making or including the personal attacks and vicious criticisms that characterized many of its predecessors (e.g., Zoe or Marcus Jones's infamous *Contributions to Western Botany*). Although this might be attributed in part to changing times and increasing professionalism among Western botanists, it is likely due more to Eastwood and Howell's particular personalities, which seemed to be more inclined toward constructive comment than remonstrating against colleagues.

⁹⁰ Due to financial constraints on the Academy during the Great Depression of the 1930s, "official Academy field trips in all departments were cancelled, departmental expenditures were cut to bare subsistence [sic] level, and curatorial salaries (including Miss Eastwood's and mine) were cut ..." (unpublished typescript of 4 April 1975 by J.T. Howell, "Alice Eastwood and John Thomas Howell (mostly concerning Eastwood & Howell field work)," Howell Archives, C.A.S. Special Collections). As a result, Howell felt that Eastwood's sponsorship of their extensive field activities during this period should be counted among her most important contributions to botany at the Academy.

⁹¹ The first set of Howell's collections is at CAS and his collection notebooks are deposited there as well. The final number in the last (vol. 68) of his notebooks is 54,754, collected in Tulare County in 1984. This was about the time he moved from his home in San Francisco to a retirement facility in Marin County. He continued to collect plants (mostly weeds in the vicinity of a vegetable garden in Terra Linda) until a year or two prior to his death, but he neither numbered these collections nor recorded them in a notebook. Only a few dozen of these latter collections were ultimately accessioned at CAS.

⁹² Howell had previously traveled with Templeton Crocker to Guadalupe Island in November 1931 (Howell 1967).

⁹³ Very likely, the only larger collection by an individual was the one made by Stewart (more than 3,000 numbers) during the Academy's 1905–1906 expedition to the Galapagos Islands.

⁹⁴ Letter of 25 January 1951 from J.T. Howell to Members of the California Botanical Club (California Botanical Club archives, Box #3, C.A.S. Special Collections).

⁹⁵ Ground was broken for this building on 19 August 1958 and the last of the Department's 415,202 specimens was transferred to the new quarters on 25 June 1959 (Department of Botany archives, Box 1, C.A.S. Special Collections).

⁹⁶ Robert Miller (Pacific Discovery 12(1):8–13, 1959) provided historical perspectives on the Academy's library up to this time.

⁹⁷ The Department occupied 9,784 square feet of space and the collections were housed in 348 herbarium cases in 1968 (Lindsay 1968).

⁹⁸ Howell's unprocessed Sierra Nevada materials were estimated to contain more than 40,000 specimens representing some 18,000 collections.

⁹⁹ Many of these publications either have been, or are currently being, revised and republished.

¹⁰⁰ At the dedication of the new departmental facilities in Wattis Hall in 1976 it was announced that Ms. Edward Hohfeld had provided the initial funding for this chair. The endowment continued to grow by additional gifts and investment returns, and attained the activation goal of \$2,000,000 in 2006.

¹⁰¹ With California's diverse climates, including an extensive region of Mediterranean climate, plants from most regions of the world can be cultivated somewhere in the state. An interest in horticulture at the Academy predates Eastwood and can be traced to several of the Academy's founders. Some of the Academy's contributions to horticulture were summarized by Reitter (1953).

¹⁰² This journal is a successor to the *Journal of the California Horticultural Society*, and McClintock succeeded Howell as its botanical editor in 1953–1954.

¹⁰³ Renamed the San Francisco Botanical Garden at Strybing Arboretum in 2004, this is San Francisco's municipal botanical garden and arboretum. It is located adjacent to the Academy's facilities in Golden Gate Park.

¹⁰⁴ Her opposition to the "Panhandle freeway" and development near Ocean Beach is chronicled in various articles in San Francisco newspapers, e.g., *San Francisco Chronicle* ("Sandstorm" Warning" 1 May 1964, page 2) and *San Francisco Examiner* ("Rare plant still plagues beach developments" 21 January 1983, p. B1). The latter article notes that her statements about the endangered dune tansy became a factor in the delay of one project, which indirectly led to a developer's bankruptcy.

¹⁰⁵ With the enactment of an employee retirement plan at the Academy in 1964, mandatory retirement at age 65 was put into effect for most employees (A. Leviton, pers. comm.). In 1978, amendments to the federal Age Discrimination in Employment Act prohibited mandatory retirement for the most part, and the practice was discontinued at the Academy.

¹⁰⁶ Annetta M. Carter (1907–1991) was a much-admired botanist who worked at the University of California's herbarium in Berkeley. Her primary interest was in the flora of the Sierra de la Giganta of Baja California Sur. She participated in Academy expeditions to the peninsula of Baja California. See Ertter (1992) for additional biographical information on Carter.

¹⁰⁷ Walther (1892–1959), who had been inspired and mentored by Eastwood, was the Arboretum's first director. During his tenure there, he added many collections of exotics cultivated in Golden Gate Park, nurseries, and gardens throughout the state to the Academy's herbarium. Indeed, Eastwood attributed the excellent collection of ornamental plants in the herbarium primarily to his efforts (Department of Botany archives, Box 1, C.A.S. Special Collections). By 1944, Eastwood was able to boast that "our herbarium has become the chief reference for cultivated plants in the west" (Department of Botany archives, Box 1, C.A.S. Special Collections). Upon retirement, Walther took up residence in the Department of Botany and worked on a monograph of *Echeveria* (Crassulaceae) that was edited by Howell and published by the Academy in 1972 (Walther 1972).

¹⁰⁸ Construction of the four-story Wattis Hall, containing a parking garage in the basement, museum exhibits space on the ground level, the Department of Entomology on the second floor, and the Department of Botany on the third floor, was completed in 1975. The new botanical facilities were dedicated at a reception on 15 May 1976. They comprised 13,672 square feet of floor space and, with 41,942 specimen shelves, the equivalent of 1,614 standard herbarium cases. In deference to lessons learned in 1906, a walk-in and fire-proof specimen vault was constructed to house up to about 10,000 botanical type specimens. Up until this time, the botanical types had been stored in vaults only twice before, following the 1906 earthquake and fire when they were stored in the Crocker Bank vault and during World War II when they were stored in an Academy vault in the basement of Simpson African Hall (Howell 1986).

¹⁰⁹ An electronically operated compactorized storage system was installed. Because the extensive wiring

in the system was not in compliance with San Francisco's strict building codes, the wires and some other system components had to be removed and replaced with ones compliant with the codes but not designed for the electronic motors. The resulting "hybrid" system became progressively less functional to operate and more difficult and expensive to repair during the next decade. In 1989 the National Science Foundation funded a retrofit of the system to manual operation. This relieved most of the problems.

¹¹⁰ Raven's lengthy association with the Academy is discussed subsequently in the text.

¹¹¹ Published floristic studies include his checklist of the Chiapan flora in *Listados Florísticos de México IV. Flora de Chiapas* in 1986 and his introduction to and editing of the first four parts of the *Flora of Chiapas*, published by the Academy between 1981 and 1995.

¹¹² McClintock had earlier worked and received partial salary support under the auspices of an NSF-funded project (*Hortus Third*) through Cornell University (Lindsay 1968).

¹¹³ Ira L. Wiggins (1899–1987), professor of botany at Stanford University, was listed on the Academy's botanical staff as senior research botanist in 1967–1968 when he was working on the flora of the Galapagos Islands via a grant from the National Science Foundation that was administered by the Academy (Lindsay 1968); see Lindsay (1979) for biographical information on Wiggins. Wiggins's co-author on the *Flora of the Galapagos Islands*, Duncan M. Porter, was also listed as a research botanist in the Department in 1967, and he was also supported by the NSF.

¹¹⁴ For a history of the Dudley Herbarium, see Chickering (1989) or Timby (1998); for a history of biology at Stanford University, see Baumberger (1954).

¹¹⁵ Between 1946 and 1959 Day was married to Verne Grant, a well-known evolutionary biologist and student of Polemoniaceae.

¹¹⁶ Ill health eventually prevented Day from regularly coming to work at the Academy in 2005. In late 2006 she moved from the Bay Area to be cared for by family in Idaho.

¹¹⁷ The Robert Orr and Chiapan collections of macrofungi were deposited at NY in 2001 (see note 35 above).

¹¹⁸ Early curators at the Academy had scant assistance in the operation of departments and collections. Such assistance appears to have been largely on an *ad hoc* basis; prior to 1906, Hittell (1997) noted that the Academy provided some funding for an assistant (or assistants) in the herbarium from time to time. In 1896, Eastwood complained to J.N. Rose (quoted in Leviton and Aldrich 1997:364), "...I have no help and I have to do all the poisoning, checking, recording and distributing myself..." This was likely a temporary situation; various assistants in the Department during the 1890s are noted in Appendix III. Following the reopening of the Academy in Golden Gate Park in 1916, curatorial help was provided by members of the Botany Club and at various times by the institution. In her departmental report of 1928 ("Report of the Botanical Department, 1928," Department of Botany archives, Box 1, C.A.S. Special Collections) Eastwood noted that Mrs. Phelps (i.e., her sister, Kate) mounted all of the specimens, filed them in the herbarium, attended to the drying of collections, and performed various other duties. On-going, institution-funded assistance in the Department appears to have begun in the mid-1930s.

¹¹⁹ The collections manager oversees the operation of the herbarium, including supervision of curatorial assistants, herbarium records, loan and exchange programs, and collections-based projects (e.g., databasing and imaging of specimens).

¹²⁰ A floristic study of the South Mountains in the Sonoran Desert was published in *Desert Plants* (Daniel and Butterwick 1992), and a similar study of the Black Mountains in the Mohave Desert remains unpublished.

¹²¹ This publication also includes a biography of Lindsay by L.W. Mitich.

¹²² The fellowship was funded annually by Mr. and Mrs. Thomas Tilton. Mr. Tilton was a trustee, and subsequently an honorary trustee, of the Academy for many years. The fellowship was not endowed and funding for it was discontinued after Jeff Wilkinson's tenure as a Tilton Postdoctoral Fellow in the Department of Herpetology during 1997–1998.

¹²³ Smick studied Acanthaceae under Daniel. Rebecca Peters, studying Violaceae under Daniel, began her graduate studies in this program in 2001.

¹²⁴ These include (with their advisors): A. Harry, G. Lu, J. McDill, T. Morosco, L. O'Keefe, and R. Schramm (Almeda); C. Davis, Z. Deretsky, S. Franklet, B. Hall, A. Illes, H. Kho, M. Menke, N. Sammons,

M. Stalcup, and N. Strasser (Daniel); S. Lucas, C. Meldrum, J. Oppenheimer, K. Shockey (Fritsch); K. Hogan (Steiner).

¹²⁵ In 1904, William Alvord, president of the Bank of California and member of the California Botanical Club, donated \$5,000 to the Department of Botany, which then became the first research department at the Academy to have its own substantial endowment (Wilson 1955). The establishment of endowment funds, with annual usage of a portion of the earnings, has permitted specimen acquisition and research activities in the Department of Botany far in excess of what would otherwise have taken place. In addition to the three endowed curatorial chairs in botany (i.e., McAllister, Lindsay, and the yet to be filled Howell chairs), other endowed funds have been established for use by the Department. These include the Bloomer/Bryant/Hohfeld Fund for the purchase of botanical books for the library, the Lewis and Elise Rose Memorial Fund for acquisition of plant collections, the Botany Endowment Fund for special projects in botany, and several other funds for specific projects. The Rose Fund was significantly enhanced by John Rose, the son of Elise and Lewis Rose. John Rose also established a separate endowed fund at the Academy for a postdoctoral fellowship in botany.

¹²⁶ Shevock's extensive collecting activities began in 1970, and the first set of his collections is at CAS.

¹²⁷ Curators: Almeda, Daniel, Fritsch, Steiner; collections manager: Bartholomew; botanical coordinator (Madagascar): Ranarivelo; curatorial assistants: Georganne Boerger, Mona Bourell, Boni Cruz, Linda Liebelt, Stephanie Pau; secretary/receptionist: Janet Jones.

¹²⁸ There is a long tradition of volunteerism associated with the Department. Volunteers played a critical role following the destruction of the Academy in 1906. Without resources to pay technical staff, the Department relied on volunteers to help organize the incoming donations and mount specimens. Botany volunteers Ms. M.L. Campbell, Ms. G.E. Kelly, and Ms. E.P. Hawver were commended for their assistance during this period (Evermann 1916). Members of the Botany Club often provided unpaid labor in the Department during the Eastwood and Howell eras. Lewis Rose (see text) was a particularly important and effective volunteer for 30+ years during the Eastwood and Howell eras. In recent years, the Academy's volunteer services program has been a major source of volunteers for the Department. In the 14 years between 1990 and 2004, the average annual number of volunteers contributing to the work of the Department was 18.

¹²⁹ Important historical herbaria incorporated into DS include: the Harvey Herbarium (containing some 70,000 specimens, this represents one of several sets of duplicates from William Harvey of Trinity College, Dublin; it was purchased by David P. Secor and given to Stanford University in 1891; it is rich in materials from Europe, Africa, Australia, New Zealand, and from many European botanical gardens; most of these specimens date from 1750 to 1865); the herbarium of Gaston Gautier (this collection, including more than 126,000 specimens, was purchased by Herman Knoche from the Gautier heirs and given to Stanford University in 1945; it includes plants from the Mediterranean region, Asia Minor, the Balkans, North Africa, Madagascar, South Africa, and the West Indies; it includes collections of Berlandier, Bovin, Bosc, Commerson, Cuming, Dushassaing, Ecklon & Zeyher, Bombay, Forskal, Gaudichaud, Gautier, Guillemium, Kotschy, Miers, Perrottet, Schomburgk, Spruce, Verreaux, and Wallich; it also contains more than 15,000 specimens of *Hieracium* that were the basis for Arvet-Touvet's 1913 monograph of the genus); the Charles R. Orcutt Herbarium (the 15,000 or so specimens from this personal herbarium contain early collections from Baja California, southern California, and southern Mexico.); the Samuel B. Parish Herbarium (this collection of more than 30,000 specimens is rich in early collections from southern California); the herbarium of the Carnegie Institution of Washington (approximately 4,000 specimens from CI, including vouchers of studies by Clausen, Keck, Hiesey, and Nobs, were transferred to DS); and the Charles Piper Smith collection of *Lupinus* (this vast collection of North American lupines contains many types). Important major herbaria incorporated into CAS include: the Dudley Herbarium of Stanford University (containing about 750,000 specimens including all of the historical herbaria noted above, as well as collections of Stanford botanists such as Abrams, Dudley, Ferris, Raven, Thomas, and Wiggins); the Albert Prager Herbarium (the approximately 45,000 specimens purchased by the Academy in 1920 are worldwide in scope and include collections of Bêche, Boissier, Ecklon & Zeyher, Endress, Fischer & Meyer, Fleischer, Frank, Heuffel, Meyen, Prager, Schaffner, Scheele, Schimper, Schlechtendahl, Sieber, Spruner, Von Egger, and Willkom); the herbarium of Ernest Twisselmann (Twisselmann's personal herbarium of "some 20,000 specimens" was presented to the Academy in 1973 (Lindsay 1974); the first set of Twisselmann's collections from Kern County had already been deposited at the Academy); and the herbarium of

USDA Forest Service, Region 5 (this collection of 4,050 specimens, mostly from California, was transferred to CAS in 1980; the southern California branch of the Forest Service had presented its herbarium of 149 specimens (mostly *Eucalyptus*) to the Academy soon after it reopened in Golden Gate Park). Howell (1953) summarized the major collections present in the Academy's herbarium as of the middle of the twentieth century. Since that time, significant additions to the herbarium include specimens from California (e.g., Smith collections from Mendocino County, Bartholomew collections from Modoc County, Daniel and Rubtsoff collections from San Francisco County, Hoover collections from San Luis Obispo County, collections of numerous individuals from Sonoma County, Howitt and Howell collections from Monterey County, and Shevock collections from the southern Sierra Nevada), Nevada (Thiem collections), Latin America (e.g., Mexican and Central American collections of Breedlove, Almeda, and Daniel), eastern Asia (e.g., Chinese collections of Bartholomew, specimens purchased or received on exchange from several Chinese herbaria, and collections of J.F. Maxwell from Thailand), and Madagascar (e.g., collections of Almeda, Daniel, Fritsch, and de Nevers).

¹³⁰ It includes the Herman E. Hasse collection (purchased by the Academy) on which Hasse's (1913) "The Lichen Flora of Southern California" was based.

¹³¹ Sexton (1953) summarized the development and growth of the botanical library at the Academy and Eastwood's paramount role in its reestablishment following the earthquake and fire of 1906. Other than noting that it was a "great library for its time," with probably the greatest "pre-Linnaean" collection in North America, Sexton (1953:85) indicated that there was little evidence of the holdings of the library prior to 1906. However, a glimpse into its contents is recorded in a catalogue of the library published in the *Proceedings*, series 2, volume 1 in 1889, with additional accessions noted annually for several years. Jepson (1899:163) referred to botanical books in the Academy's library that relate to the flora of western North America and noted that many of these reveal that they were donations (the names of the donor in an old-fashioned hand on the inside of the cover or fly-leaf); "some of these books were the gift of Hiram G. Bloomer, and are of the kind that are now rare and difficult to obtain, including a few that deserve the name of botanical classics" (see above under Bloomer and note 26 above). British naturalist and horticultural collector Thomas Bridges noted in a letter to W.J. Hooker in 1858 that library books at the Academy included "Beechey's *Voyage*, Torrey's works, and other books" (quoted in Ewan 1955:17). Following the loss of the Academy's library in the 1906 earthquake and fire, a new set of botanical references was desperately needed for the continuance of botanical research at the institution. Eastwood's personal copies of the *Botany of the Geological Survey of California* and Asa Gray's *Synoptical Flora* had been saved in 1906 because they had been loaned to out-of-town botanists (Wilson 1955). These books, together with others donated by a variety of institutions and individuals, were the nucleus of the new botanical library at the Academy. In recognition of her contributions to botany at the Academy (e.g., establishment of an endowment fund to purchase botanical books for the library and the establishment of the Howell Chair in botany), the Board of Trustees named the Department's library, the Lillian Devendorf Hohfeld Botanical Library in 1976. The Hohfeld Library is currently located in the Department of Botany and contains primarily strictly botanical resources; interdisciplinary works that may include botanical studies are housed in the Academy's main library (i.e., J.W. Mailliard Library). In the new Academy facilities, due to open in Golden Gate Park in 2008, it is anticipated that the botanical library resources will be housed in a single, unified Academy library.

¹³² These consist of the Academy's botany reprint collection (231 linear feet), the Dudley Herbarium's reprint collection (98 linear feet), and the Adolf Engler Reprint Collection (183 linear feet). Engler's personal reprint collection was purchased from Ms. Engler, widow of the important German systematist, by Herman Knoche in 1930. The collection, consisting of some 25,000 items, was presented to the Dudley Herbarium following Knoche's death in 1945 (Chickering 1989).

¹³³ While some training in botanical science was typically a part of medical training in the nineteenth century, neither of these Academy scientists was trained as a botanist.

¹³⁴ Leviton and Aldrich (1997) listed individual and institutional donors to the Academy's library following the earthquake and fire of 1906.

¹³⁵ Eastwood and Howell had both been major collectors, but Breedlove surpassed each of them in quantity of materials gathered. With the evolution of curatorial research at the Academy away from extensive floristic work and toward focused monographic taxonomy in a phylogenetic context, it seems unlikely that

future botanical curators at the institution will surpass his collecting accomplishments.

¹³⁶ 2,731 collections of this well-known nineteenth century collector of Mexican plants were purchased by the Department (Department of Botany archives, Box 1, C.A.S. Special Collections).

¹³⁷ These are the internationally recognized abbreviations for the Dudley Herbarium of Stanford University (now housed at the Academy) and the Academy's herbarium.

¹³⁸ Kellogg, Eastwood, Howell, and McClintock never married. Eastwood had planned to marry at least twice: while in Colorado to an Eastern journalist who had come to Denver to recover from tuberculosis, but who died (which likely spurred her to accept K. Brandegee's offer to come to San Francisco as joint-curator of botany at the Academy; Wilson 1955); and later in San Francisco to her older friend, Grove Karl Gilbert, whose sudden death (Leviton et al. 2006) prevented the marriage.

¹³⁹ See note 54 above regarding the herbarium's location in the gallery of the old First Congregational Church building for some 17 years. Samuel B. Parish (1838–1928) was a rancher and an avocational botanist in southern California until he moved to Berkeley in 1920 and became an honorary curator at the herbarium of the University of California. His herbarium of more than 30,000 specimens was purchased by Stanford University in 1917 and is now at the Academy. Jepson (1932) provided an account of his life, botanical travels, and publications.

¹⁴⁰ Information about Rose is based on Howell (1953), Thomas (1961a), and various obituaries and articles in the Lewis S. Rose file in the Department of Botany "biography files."

¹⁴¹ Plants of the *Clarkia* had been previously collected by K. Brandegee and Eastwood, but had remained unnamed. Raven's recollection of them and subsequent systematic evaluations revealed them to represent a previously undescribed species (Lewis and Raven 1958).

¹⁴² The 300 elected fellows of the Academy are the ultimate governing body of the institution. In 2003, the fellows included 40 botanists (Anonymous 2003).

¹⁴³ The largest and most important collection at San Francisco State University is mycological.

¹⁴⁴ The Belvedere Scientific Fund of San Francisco was sponsored by Kenneth K. Bechtel. It supported expeditions, publications, and motion pictures on the natural history of Baja California.

¹⁴⁵ This contribution was written in 2003. Only limited updates have been made (mostly in the notes) since that time. In March 2008, the Department of Botany relocated from its interim quarters at 875 Howard Street back to Golden Gate Park and into the Academy's newly constructed museum facilities.

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APPENDIX I. Botanical curators by year. Information herein has been derived from Hittell (1997), files in the Academy's Archives (which are based on data from Trustees Minutes and Council Minutes), and the *Proceedings of the California Academy of Sciences*. For years in which no botanical curator is indicated by these sources, "unknown" is stated.

| | |
|---|--|
| 1853–54 Kellogg | 1888–89 Curran, Davis |
| 1855 Andrews (until 2 April), Behr (from 2 April) | 1890 K. Brandegee, Rattan |
| 1856 Bloomer | 1891–92 K. Brandegee |
| 1857 unknown | 1893 K. Brandegee, Eastwood |
| 1858–62 Bloomer | 1894 Dudley, Eastwood |
| 1863–64 Kellogg | 1895 Eastwood |
| 1865–67 Bolander | 1896 Eastwood, Harkness (curator of fungi) |
| 1868 Bloomer | 1897–1930 Eastwood |
| 1869 unknown | 1931–48 Eastwood, Howell |
| 1870 unknown | 1949–68 Howell, McClintock |
| 1871–72 Bolander | 1969–74 Breedlove, McClintock, Thomas |
| 1873 unknown | 1975 Breedlove, Day, McClintock, Thomas |
| 1874 unknown | 1976 Breedlove, Day, Earle (curator of phycology), McClintock, Thomas |
| 1875 Bolander | 1977 Breedlove, Day, Earle (curator of phycology), McClintock, Thomas |
| 1876 Kellogg | 1978–85 Almeda, Breedlove, Day, Earle (curator of phycology), Thomas |
| 1877 unknown | 1986–94 Almeda, Breedlove, Daniel, Thomas |
| 1878 unknown | 1995 Almeda, Daniel, Thomas |
| 1879 Kellogg | 1996–97 Almeda, Daniel, Fritsch, Thomas |
| 1880 unknown | 1998–99 Almeda, Daniel, Fritsch |
| 1881 Kellogg | 2000–03 Almeda, Daniel, Fritsch, Steiner |
| 1882 Moore | |
| 1883 Curran, Moore | |
| 1884–87 Curran, Greene | |

APPENDIX II. Departmental Associates. Throughout its history, the Academy's Department of Botany has served as the botanical headquarters for numerous amateur and professional botanists who were not on its payroll but active in collections-based research. The California Botanical Club and many of its mostly avocational botanists were headquartered in the Department since the Club's founding in 1891. Those persons formally accorded the title of Associate (including Field Associates and Research Associates), and often whose primary place of botanical work was at the Academy, are listed below along with their botanical interests while at the Academy.

| | |
|---|--|
| Barrett Anderson (Lamiaceae, flora of California) | Reid Moran (flora of Baja California and Guadalupe Island, Crassulaceae) |
| Catherine Best (flora of Sonoma County) | Daniel Norris (bryophytes) |
| Guido J. Braem (Orchidaceae) | Robert Ornduff (pollination systems) |
| Mary L. Butterwick (flora of Arizona, Cucurbitaceae) | Robert W. Patterson (Polemoniaceae) |
| Alva Day (Polemoniaceae) | Henry M. Pollard (flora of Ventura and Santa Barbara counties) |
| Greg de Nevers (Arecaceae, flora of Pepperwood Reserve) | Peter H. Raven (student collector; Flora of San Francisco) |
| Barbara Ertter (flora of California, Rosaceae) | Orbelia Robinson (Melastomataceae) |
| Wilma Follette (flora of Marin County) | Lewis S. Rose (plants of California) |
| Thomas C. Fuller (weeds and poisonous plants of California) | Peter Rubtsoff (flora of San Francisco; flora of San Bruno Mountain) |
| Nir L. Gil-ad (Violaceae) | James R. Shevock (California flora, bryophytes) |
| Clare B. Hardham (Lamiaceae, flora of San Luis Obispo County) | Gladys L. Smith (flora of Mendocino County) |
| Robert F. Hoover (flora of San Luis Obispo County) | John W. Stacey (Carex in western North America) |
| Beatrice F. Howitt (flora of Monterey County) | Susan G. Stokes (Eriogonum) |
| James D. Jokerst (flora of California) | John L. Strother (Asteraceae) |
| Thomas L. Kearney (flora of Arizona, Malvaceae) | Dorothy Sutcliffe (Hepaticae, flora of California) |
| Barbara Keller (cultivated plants) | David Toren (bryophytes) |
| Walter Knight (flora of Sonoma County) | Gordon H. True (flora of Nevada County) |
| Irja Knight (flora of Sonoma County) | Ernest C. Twisselmann (flora of Kern County) |
| Hans Leschke (Carex) | Mary P. Wells (flora of Sonoma County) |
| Roger Macfarlane (Liliaceae) | Ira L. Wiggins (plants of northwestern Mexico and Galapagos Islands) |
| DeAda Mally (Orchidaceae) | |
| William A. McNamara (flora of Asia) | |

APPENDIX III. Departmental support staff and postdoctoral fellows. The following individuals are known to have been employed by the Academy in the Department of Botany through 2003. The dates given reflect those noted by Hittell (1997), in the Academy's published annual reports (where available), and in the Department's unpublished annual reports (where available). Until 1950, annual reports were based on calendar years; beginning 1 July 1951, annual reports were based on fiscal years ending on 30 June. As a result, some dates indicated below do not necessarily reflect hiring dates (which may have been in the calendar year previous to that indicated). While the readily available records are extensive, they are not complete. Numerous illustrators/artists have worked in the Department for various projects, usually on a contract basis for individual curators. Since 1985, these have included: T. Bell, M. Butterwick, T. Cash, E. del Valle, M. Fylling, S. Guthrie, J. Kane, N. King, P. Hayes, D. Louie, S. (Hill) Myers, H. Pazdírková, C. Rendu, V. Saxe, J. Speckels, C. Sudekum, and M. Tenorio. Interns in botanical illustration through the Academy's Fellows Illustration Intern program are listed in the text.

- Joy Albright-Souza, Curatorial Assistant (1994–96, 2000), Senior Curatorial Assistant (2001)
 Barrett Anderson, Research Assistant (1986–88)
 Luis Baptista, Herbarium Assistant (1966)
 Bruce Bartholomew, Collections Manager (1983–90), Senior Collections Manager (1991–)
 Nova Bevel, Curatorial Assistant (1971)
 Isabel Boardman, Typist (S.E.R.A.) (19??)
 Charles Boatman, Curatorial Assistant (1971–72)
 Brita Boeckel, Assistant (1957–60, 1964)
 Lee Boerger, Curatorial Assistant (1988–)
 Mona Bourell, Curatorial Assistant (1982–85), Senior Curatorial Assistant (1986–)
 Mrs. H.P. Bracelin, Assistant (1935–36, 1940–43)
 Marie Buffam, Typist (W.P.A.) (1938)
 Marian L. Campbell, Assistant (1917–1921)
 Sheila Campion, Secretary (1972)
 Evelina Cannon, Assistant (1895–?, 1899–1901)
 Doris Cantou, Assistant (1964–65), Bibliographer (1966)
 Blanche Clear, Assistant (1938–40, 1958–68)
 Anne Clemons, Assistant (S.E.R.A.) (19??)
 Mary Jo Cobb, Assistant (1948–50, 1953)
 Steven Corso, Curatorial Assistant (2000)
 Boni Cruz, Senior Curatorial Assistant (2002–)
 Mary Davis, Curatorial Assistant (1971)
 Evelyn Deasy, Typist (1945, 1948–52)
 Adele Doss, Typist (1952)
 Dorothy Duff, Assistant (1917)
 Charles Durege, Curatorial Assistant (1971–72)
 Alice Eastwood, Assistant (1892)
 Claire Etienne, Curatorial Assistant (1969–74)
 Georgia Fitzsimmons, Assistant (1945)
 Stina Freitas, Curatorial Assistant (1993–94)
 Rosalie Farish, Assistant (1896)
 Evelyn Graham, Assistant (1937)
 Virginia Gregory, Secretary (1976–78)
 Betty Hammerly, Assistant (1941–42)
 Suzanne Harmon, Curatorial Assistant (2001–02)
 John T. Hicks, Curatorial Assistant (1974)
 Robert F. Hoover, Assistant (1948)
 Nancy Horsman, Scientific Assistant (1981)
 John T. Howell, Assistant (1930)
 Sharon Hue, Curatorial Assistant (1971–72)
 Zoe Irving, Curatorial Assistant (1971)
 Carolyn Jones, Typist (1956–57)
 Janet Jones, Secretary (1979–1998), Senior Secretary (1998–)
 Mary E. Jump, Assistant (1939)
 Saichi Kawahara, Curatorial Assistant (1969, 1971)
 Barbara Keller, Curatorial Assistant (1975–77), Senior Curatorial Assistant (1978–86)
 Walter Knight, Assistant (1965)
 Leslie Landrum, Tilton Postdoctoral Fellow (1983–1984), Research Assistant (1986)
 Sonia Landrum, Secretarial Assistant (1984–86)
 May Larsen, Assistant (1947–48)
 Joan Leong, Preparator (1985)
 Linda Liebelt, Curatorial Assistant (1991–)
 Carole Litwin, Curatorial Assistant (2000)
 Gabriel Mascardo, Computer Specialist (1993–95)
 Yvonne Mason, Curatorial Assistant (1972)
 Elizabeth McClintock, Research Assistant (1948–49)
 Effie A. McIlriach, Assistant (1893–1895?)*
 Kenneth Miller, Curatorial Assistant (1971–72)
 Virginia Moore, Technical Assistant (1964–68), Senior Curatorial Assistant (1969), Curatorial Assistant (1970–71)
 Jude Mullé, Curatorial Assistant (1997)
 Judy Murray, Curatorial Assistant (1969)
 Gwendolen O. Newell, Assistant (1899–1906).
 Anita Noldeke, Assistant (1958–68), Curatorial Assis-

- tant (1969–81), Preparator (1982)
 Sally Norwall, Assistant (1958–68)
 Olga Padgett, Assistant (1948–61)
 Stephanie Pau (2001–03)
 Javier Peñalosa, Assistant (1961)
 Ana Maria Penny, Curatorial Assistant (1988–90)
 Kate E. Phelps, Assistant (1919–1948)**
 Peter Raven, Assistant (1949–56)
 Jane Reese, Technical Assistant (1964)
 Norval Reeves, Curatorial Assistant (1971)
 Suzanne Richardson, Curatorial Assistant (1974)
 Orbelia Robinson, Research Assistant (1987–90),
 Editorial Assistant (1991–)
 Lorraine Rogers, Typist (1953–56)
 Barbara Shervanick, Curatorial Assistant (1969–70)
 Robert Setzer, Curatorial Assistant (1969–70)
 Gary Shepard, Curatorial Assistant (1972)
 Quinn Sinnott, Curatorial Assistant (1973–74, 1976)
 Geoff Smick, Curatorial Assistant (2000)
 Gladys Smith, Technical Assistant (1954, 1959–63)
 Linda Smith, Curatorial Assistant (1972–74), Typist
 (1974–75)
 Debbie Stamp, Preparator (1985)
 Mrs. J.M. Stone, Assistant (1948)
 Colleen Sudekum, Curatorial Assistant (1981–90)
 Sanford Tepfer, Assistant (1947)
 Clara Tose, Assistant (1925)
 June A. Tracy, Curatorial Assistant (1974)
 Barbara Trowbridge, Curatorial Assistant (1969–70,
 1978–79)
 Ivan Valdespino, Tilton Postdoctoral Fellow
 (1995–96)
 Elizabeth M. Vincent, Assistant (1943–52)
 Mabel Weed, Assistant (1941)
 Philip Wheeler, Assistant (1965–66)
 Debbie Wilson, Curatorial Assistant (1980–81);
 Preparator (1982–87)
 Randi Wilson, Curatorial Assistant (1978–79)
 Alice B. Wright, Assistant (1941, 1943–47)
 Frank Yamasaki, Curatorial Assistant (1969)

* In a letter of 20 February 1895 from Eastwood to K. Brandegee (preserved in the archives of the University and Jepson herbaria, University of California, Berkeley) Eastwood noted, "Effie is now in the library all the time and I have made out an application for continual assistance in the Herb., which I shall send in at the next meeting of the Council." Hittell (1997:368) noted that on 4 November 1896, "the salary of Miss Effie McIlriach, as assistant secretary and librarian, was raised..." It is unlikely that she was still working in the Department of Botany at that time. She was elected a resident member of the Academy in 1900 (Hittell 1997). Upon her marriage in 1902, she became Mrs. Cloudsley Rutter, was relieved of her duties as assistant secretary and librarian, and appointed to supervise the printing and do the proof-reading of the Academy's publications (Hittell 1997).

** Eastwood's sister, often listed in documents as Mrs. George H. Phelps, appears to have been paid, either for the most part or entirely, by Eastwood for her services to the Department. It is unclear whether she was always paid or whether, in some years (e.g., 1939–40), she worked strictly as a volunteer.

Appendix IV. Apparently unpublished drawings of Kellogg that are extant in the herbarium of the California Academy of Sciences. A drawing of *Mertensia stomatechoides* Kellogg that was published in the protologue of that species (*Proc. Calif. Acad. Nat. Sci.* 2:148. 1863) is also extant at CAS.



FIGURE 30. *Ribes nevadense* Kellogg. "Dr. Kellogg also exhibited a complete drawing of a species of wild Black Mountain Currant, together with specimens of the bush and ripe fruit." (*Proc. Calif. Acad. Nat. Sci.* 1, ed. 2:9. 1873.)



FIGURE 31. *Viola purpurea* Kellogg. "Dr. Kellogg exhibited drawings and specimens of two species of violet from the interior, neither of which are described, so far as we are able to learn." (*Proc. Calif. Acad. Nat. Sci.* 1:56. 1855.)



FIGURE 32. *Fritillaria viridis* Kellogg. "Dr. Kellogg exhibited a drawing, accompanied by specimens of a new species of *Fritillaria*, from New Idria, California, presented by Dr. Veatch, and cultivated by H.G. Bloomer." (*Proc. Calif. Acad. Nat. Sci.* 2:9. 1863.)

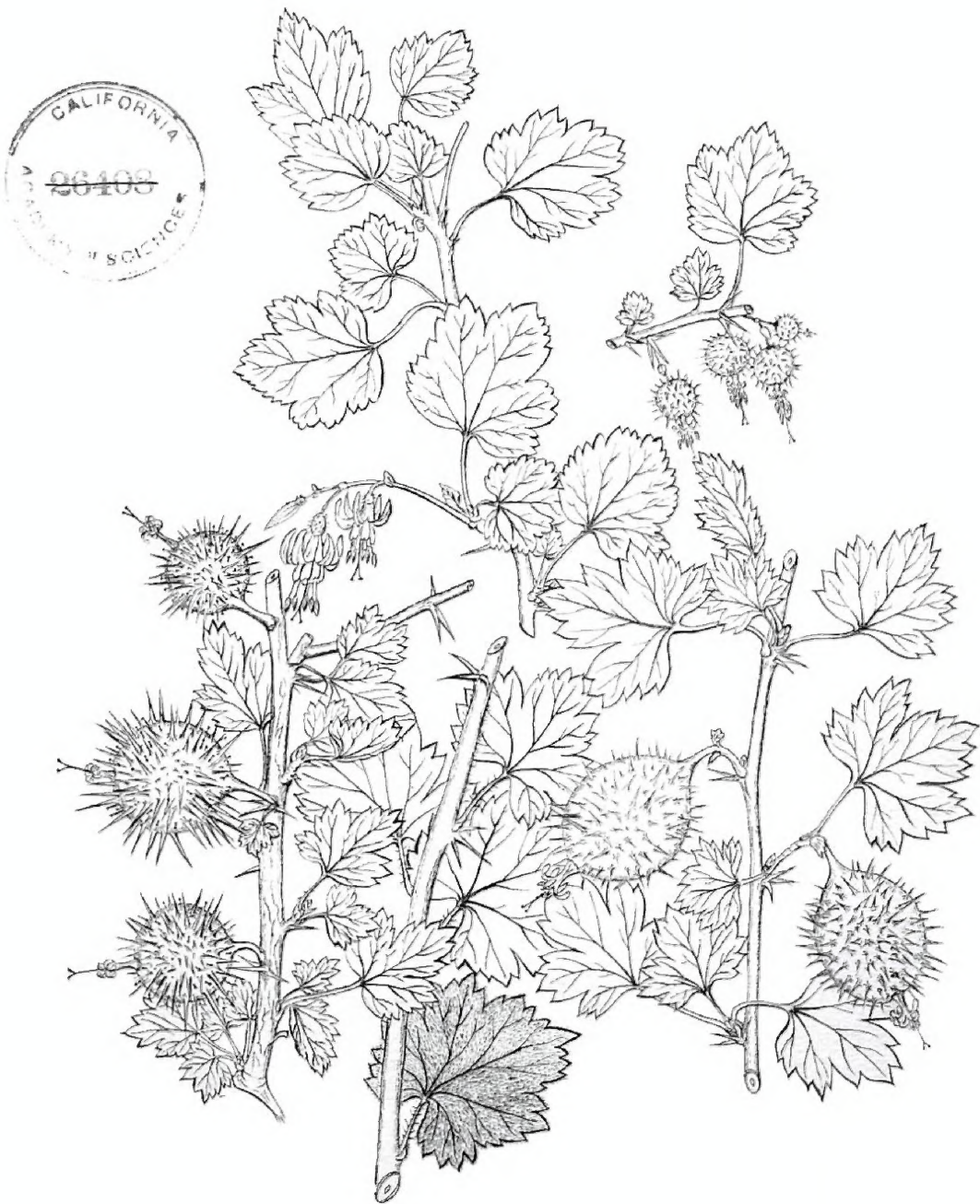


FIGURE 33. *Ribes menziesii* Pursh.